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# The EDISON ELECTRIC INSTITUTE BULLETIN

December 1958

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ublished Monthly by Edison Electric Institute

## Report on Power in Russia

*Walker L. Cisler*

*Elmer L. Lindseth* *Edwin Vennard*

## Our Common Problem

*J. W. McAfee*

## Analysis of I atal Accidents

*S. H. Young*

## Research by Electric Utilities

*Howard P. Seelye*

## EEI Committee Meetings

*F. A. Salmon* *W. M. Penney*

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# ELECTRICAL RESEARCH STATISTICS
# THE ELECTRIC LIGHT AND POWER INDUSTRY

***Current Statistical Data Covering 100 Per Cent of Industry***

***(Includes Investor-Owned Companies, Cooperatives, and Government-Owned Utilities)***

*September 1957-1958*

## SOURCE AND DISPOSAL OF ENERGY—MONTH OF SEPTEMBER

| | 1958 | 1957 | % |
|---|---|---|---|
| **NET GENERATION* (Kwhrs in Thousands)** | | | |
| By Fuel Burning Plants | 43,258,024 | 42,290,954 | + 2.3 |
| By Water Power Plants | 10,735,105 | 9,282,263 | +15.7 |
| **Total Generation** | **53,993,129** | **51,573,217** | **+ 4.7** |
| ADD—Net Imports Over International Boundaries | 227,036 | 207,463 | + 9.4 |
| Less—Company Use | 158,482 | 152,230 | + 4.1 |
| Less—Energy Used by Producer | 1,459,918 | 1,164,974 | +25.3 |
| **Net Energy for Distribution** | **52,601,765** | **50,463,476** | **+ 4.2** |
| Lost and Unaccounted for | 3,386,498 | 3,081,371 | + 9.9 |
| **Sales to Ultimate Customers** | **49,215,267** | **47,382,105** | **+ 3.9** |

## CLASSIFICATION OF SALES

| | | | |
|---|---|---|---|
| **NUMBER OF CUSTOMERS—As of September 30th** | | | |
| Residential or Domestic | 47,486,998 | 46,606,256 | + 1.9 |
| Rural (Distinct Rural Rates) | 1,665,466 | 1,641,599 | + 1.5 |
| Commercial or Industrial: | | | |
| Small Light and Power | 6,285,660 | 6,207,627 | + 1.3 |
| Large Light and Power | 316,539 | 312,105 | + 1.4 |
| Other Customers | 187,804 | 181,083 | + 3.7 |
| **Total Ultimate Customers** | **55,942,467** | **54,948,670** | **+ 1.8** |
| **KILOWATTHOUR SALES—During Month of September (Kwhrs in Thousands)** | | | |
| Residential or Domestic | 12,943,398 | 11,897,305 | + 8.8 |
| Rural (Distinct Rural Rates) | 1,169,810 | 1,188,941 | − 1.6 |
| Commercial or Industrial: | | | |
| Small Light and Power | 9,365,442 | 8,679,743 | + 7.9 |
| Large Light and Power | 23,853,507 | 23,845,487 | 0.0 |
| Street and Highway Lighting | 448,601 | 415,457 | + 8.0 |
| Other Public Authorities | 1,089,380 | 984,674 | +10.6 |
| Railways and Railroads: | | | |
| Street and Interurban Railways | 155,819 | 168,256 | − 7.4 |
| Electrified Railroads | 133,241 | 146,698 | − 9.2 |
| Interdepartmental | 56,069 | 55,544 | + 0.9 |
| **Total to Ultimate Customers** | **49,215,267** | **47,382,105** | **+ 3.9** |
| **Revenue from Ultimate Customers (Thousands)** | **$840,854** | **$793,263** | **+ 6.0** |

## RESIDENTIAL OR DOMESTIC SERVICE

| | | | |
|---|---|---|---|
| **AVERAGE CUSTOMER DATA—for 12 months ended September 30, 1958** | | | |
| Kilowatthours per Customer | 3,331 | 3,121 | + 6.7 |
| Average Annual Bill | $84.27 | $80.21 | + 5.1 |
| Revenue per Kilowatthour | 2.53¢ | 2.57¢ | − 1.6 |

* By Courtesy of the Federal Power Commission.

THE EDISON ELECTRIC INSTITUTE BULLETIN is published monthly by the Edison Electric Institute, an association of electric light and power companies in the United States and its territorial possessions. Its affiliate members consist of members of the Canadian Electrical Association and private electric utilities in Latin America and contiguous islands in the Western Hemisphere.

*The objectives of the Edison Electric Institute are:*

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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*The* EDISON ELECTRIC INSTITUTE BULLETIN

*December, 1958*

Vol. 26 No. 11

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# CONVENTIONS AND MEETINGS

## 1958

### DECEMBER

1- 3 EEI-AGA Electronics Seminar, Commodore Hotel, NYC

2 EEI-AGA 1959 Accounting Conference Planning Committee, Room No. 1, EEI Headquarters, NYC.

4 EEI Industrial Relations Committee, EEI Headquarters, NYC.

4- 5 EEI-AGA Customer Accounting Committees, Belmont Plaza Hotel, NYC.

4- 5 EEI Electric Space Heating & Air Conditioning Committee, St. Louis, Mo.

4- 5 EEI Residential Lighting Promotion Committee, New York City, N. Y.

8 PIP Steering Committee Meeting, Palmer House, Chicago, Ill.

8- 9 EEI-AGA Accounting Developments Service Committees, Atlanta Biltmore Hotel, Atlanta, Ga.

8- 9 EEI-AGA Accounting Employee Relations Committees, Atlanta Biltmore Hotel, Atlanta, Ga.

8- 9 EEI-AGA Customer Collections Committees, Atlanta Biltmore Hotel, Atlanta, Ga.

8- 9 EEI-AGA Customer Relations Committees, Atlanta Biltmore Hotel, Atlanta, Ga.

10-11 EEI Street Lighting Committee, Hendersonville, N. C.

11 EEI-AGA Depreciation Accounting Committees, Boardroom, AGA Headquarters, NYC.

11 National Electric Living Program Press Conference, New York City, N. Y.

12 EEI-AGA Depreciation Accounting Committees, Rooms 1-2, EEI Headquarters, NYC.

18 EEI Investor Relations Committee, Music Room, Hotel Biltmore, NYC.

## 1959

### JANUARY

5- 6 EEI Accounting Division Advisory & Executive Committee, Louis XVI Suite, Waldorf Astoria Hotel, NYC.

8-10 Third Annual LBE National Women's Conference, Chicago, Ill.

15-16 EEI Industrial Power & Heating Group, Biltmore Hotel, Atlanta, Ga.

15-16 Joint EEI Industrial Relations Committee-Personnel Practices Committee of the Pennsylvania Electric Association, Carlton House, Pittsburgh, Pa.

29-30 PUAA Region 9 Meeting, Timberline Lodge, Portland, Ore.

### FEBRUARY

2- 4 EEI Prime Movers Committee, Hotel Beaumont, Beaumont, Texas

5- 6 Missouri Valley Electric Association Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo.

12-13 EEI Transmission and Distribution Committee, Morrison Hotel, Chicago, Ill.

12-13 Pacific Coast Electrical Association Business Development Conference, Hotel Sheraton-Palace, San Francisco, Calif.

16-17 EEI-AGA Accounting Conference Final Working Committee, Lord Baltimore Hotel, Baltimore, Md.

16-17 EEI Electrical System & Equipment Committee, Atlanta Biltmore Hotel, Atlanta, Ga.

26-27 PUAA Region No. 1 Meeting, New Haven, Conn.

### MARCH

5- 6 Joint EEI Industrial Relations Committee-Personnel Administration Section, Southeastern Electrical Exchange, Mayflower Hotel, Washington, D. C.

26-27 Oklahoma Utilities Association Annual Convention, Mayo Hotel, Tulsa, Okla.

30-31 Pacific Coast Electrical League Engineering and Operating Conference, Hotel Lafayette, Long Beach, Calif.

### APRIL

6- 8 EEI 27th Annual Convention, New Orleans, La.

6- 9 EEI-AGA 18th Annual Conference on Operation of Public Utility Motor Vehicles, Netherland Hilton Hotel, Cincinnati, Ohio

8- 9 Pacific Coast Electrical Association Administrative Services Conference, Hotel Lafayette, Long Beach, Calif.

15-17 Missouri Valley Electric Association Engineering Conference, President Hotel and Municipal Auditorium, Kansas City, Mo.

16-17 EEI Electric Power Survey Committee, EEI Headquarters, New York City, N. Y.

20-22 EEI-AGA National Conference of Electric and Gas Accountants, Sherman Hotel, Chicago, Ill.

27-29 EEI Meter & Service Committee, Chase Hotel, St. Louis, Mo.

30-May 1 EEI Statistical Committee, Dearborn Inn, Detroit, Mich.

### MAY

4- 6 EEI Purchasing and Stores Annual Meeting, Hotel Soreno, St. Petersburg, Fla.

4- 6 EEI Prime Movers Committee, Palmer House, Chicago, Ill.

7- 8 EEI Transmission & Distribution Committee, Shoreham Hotel, Washington, D. C.

20-22 Pacific Coast Electrical Association Annual Convention, Fairmont Hotel, San Francisco, Calif.

### JULY

6- 8 EEI Accident Prevention Committee, Biltmore Hotel, Los Angeles, Calif.

### SEPTEMBER

14-15 EEI-AGA 1959-1960 Accounting Division & Section Organization Meetings, Hotel Cleveland, Cleveland, Ohio

# Power in Russia

## *An Engineer's View*

**By Walker L. Cisler**
*President, The Detroit Edison Co.*

Condensed from a series of newspaper articles by Mr. Cisler as told to Jack Pickering in *The Detroit Times*. Copyright, 1958, by *The Detroit Times*. Reprinted by permission of *The Detroit Times*.

I THINK the people we met were glad to have us there. We have good reason to know, from this trip, that in many widely divergent fields, our thinking is remarkably close together. I say this in the sense of engineering thinking, in method sometimes and often in the approach to the basic problems of providing power.

The Soviets showed us their plants and answered our questions. Today, this year, and for some years to come, the USSR and its people must increase their power supplies quickly and in large amount—and not necessarily by the use of nuclear power. This they are doing skillfully and wisely and very industriously.

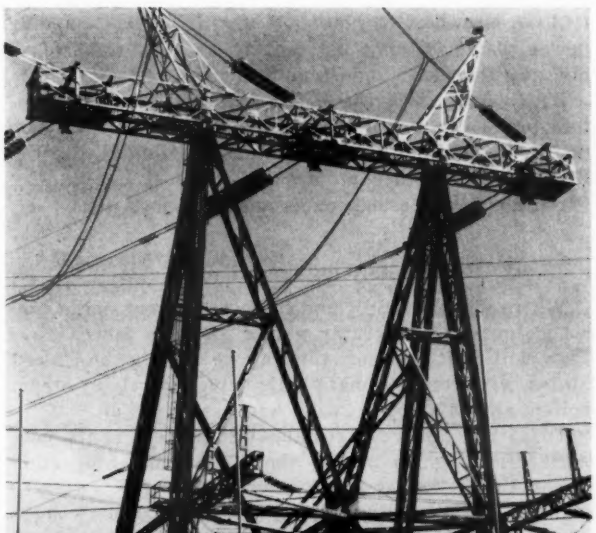
The supply of electric energy can be translated directly into the economic well-being of every society. Electric power, or its equivalent in other forms, represents the sinews, the muscles of an economy. Whether these "muscles" are used for good purpose or evil is the overwhelming problem for the world to meet. It is the question of war or peace. If we are to have peace, we must look at our affairs through peaceful eyes. In this sense, we found the Soviets talking to us as engineers who are making their country into a strong nation. They are doing it well. In some respects we can learn from them; in other respects they can learn from us.

In the normal course of events we should expect to see the USSR expanding its power-generating capacity, and its economy, at a substantial rate.

The power plants shown us are part of systems which

**Recently a 10-man delegation representing the electric utility industry and manufacturers of electrical equipment went to Russia to visit electric power systems and plants that manufacture electrical equipment. The impressions of three of the executives who visited the USSR are presented here.**

The towers of old Moscow church, above, represent a bygone era in Russian history. More recently the towers being built there are like the power transmission tower, below.



have a total capacity of 48.3 million kilowatts. This is for a population of more than 200 million. It compares, as of the beginning of this year, with about 150 million kw being used by our 175,000,000 people.

In those simple statistics is a picture of Soviet economy, productive strength or standard of living, depending on which term you prefer.

### Soviet Power Struggle Is Electrifying

Until recently, the USSR has been doubling its electric power capacity every five years, bringing it to the present 48.3 million kw. Now they are in the process of doubling every six or seven years. For some time we have been doubling our output every 10 years. Percentagewise, we are not increasing as rapidly as the Soviets. Where we must keep pace with the continuing growth of our economy, the USSR still must make up for lost time.

In America, roughly a third of our electric power is for domestic use; another third for commercial use; a third for industrial use. There are visible signs that in Russia more goes into industry, less for domestic use.

They have electric refrigerators, but refrigerators and other household appliances are not yet the household necessity that we have made them in the United States. Hotels have elevators but it is not yet time to put them in every apartment building. It is more important to have apartments! There are more trucks than passenger cars in the USSR and truck drivers are required to pick up people asking for transportation. We who made this trip can see no possible reason to question the principle of putting first things first.

All this is part of the Soviets' problem. Neither the recognition of the need, nor the effort to do something about it, is new. We saw the Dnieperstroi power plant, rebuilt after destruction in wartime. It was built originally in the 1930's under the direction of Col. Hugh Cooper, an American who built our own Keokuk on the Mississippi. At that time the USSR needed engineers trained elsewhere to build things for her, including power plants. Today the Soviets are well capable of building their own industrial facilities.

By 1965 or 1966, the USSR expects to have generators producing 60 million kw of electricity in addition to the 48.3 million kw it had at the beginning of 1958. But they have other problems. The most urgent are: First, housing. Second, roads and transportation.

### Soviets Rely on Traditional Fuels

Where will the USSR find the power to run these proposed immense generator plants? Atomic power? No. They will do it precisely the way we do it in the United States, with conventional plants driven mostly by steam boilers and to a lesser extent with water power.

Today the USSR derives about 20 percent of its electricity from hydro power, about the same proportion as the United States.

In her building program for the next seven or eight years, the USSR, like the United States, will tend toward thermal power and away from hydro power.

I had not realized that the Soviets amortize their investments such as power plants, paying off the initial cost out of income from the sale of power over perhaps 25 or 50 years. They do not recognize interest in the sense we do since their economic system is unlike ours in many respects. But under any system certain fundamentals prevail—that as a group we cannot have what we do not earn, and we cannot spend what we do not have.

The Soviets thus keep account of what power costs to produce. They are realists.

We saw the new Kuibyshev hydro plant on the Volga and were impressed. Engineers had created a lake 300 miles long and at some points 24 miles wide, moving 200 villages out of the way. The water drives 20 generators, each producing 115,000 kw, a total of 2,300,000 kw, making the plant the world's largest.

We saw many conventional steam boiler plants in Moscow. One of the newest had three 150,000-kw units, with a fourth to be added. The Soviets are completing one 200,000-kw steam turbine generator unit, designing one of 300,000 kw, and doing research aimed at units of 400,000 and 600,000 kw. They are doing a great deal of prefabricating of parts. No engineer can help but have great respect for the way the Soviets are building.

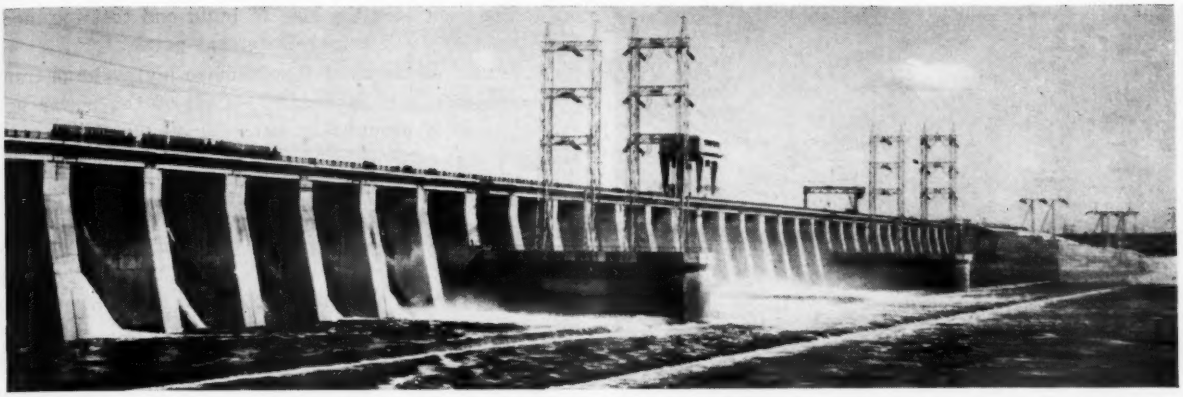
Throughout our trip of 4000 miles we were constantly seeing examples of Soviet readiness to find new engineering frontiers to conquer. Transmission of power is far from easy. Lines carrying 110,000 and 220,000 volts are common in the USSR and already they have gone to higher voltages. They already have two 400,000-volt lines from their Kuibyshev plant to Moscow and later will change these to 500,000 volts. This is a great accomplishment, considering the distance is about 600 miles.

The Soviets are efficiently developing new thermal generating plants and in their research institutes are working on the same problem which forward-looking power people are studying elsewhere. A 200,000-volt direct current line is in operation over a span of about 60 miles for assemblying technical data and experience in high voltage d-c lines. They are a significant development. Long, high-tension a-c lines present such problems as corona around the wires which is wasteful and causes mischief of other sorts. Development of techniques for high-voltage d-c transmission permits moving very large blocks of power over long distances without many of the drawbacks of a-c.

### USA, USSR Are Close

The Soviets know that power derived from atomic fission cannot yet compete in price with power derived from coal, oil or gas as fuel, or the energy of falling water. Like us, they will continue to use conventional fuels as long as supplies of them are sufficient and the cost is lower than the cost of power from fission. At the same time, it is perfectly clear that the USSR is not lagging in the understanding of either fission or its more powerful partner, fusion.

We visited the Soviet atomic plant about 70 miles from Moscow, a 5000-kw plant which has been in operation since 1954 and is being used for research as well as to produce power. (A 100,000-kw plant in Siberia was announced a few days later.) A site is being pre-



The Russian Kuibyshev hydro plant on the Volga River is said to be the largest in the world. The water drives 20 generators, each producing 115,000 kilowatts for a total of 2,300,000 kw. Two 400,000-volt lines carry power to Moscow from this dam.

pared near Moscow for a large new nuclear power plant, and others are being planned in the Urals and near Leningrad. These plants will be of differing types and one will be of 400,000-kw capacity, four units with a separate reactor for each, one rated at 200,000 kw, three at 70,000 each.

In this type of undertaking, learning the benefits and shortcomings of various reactor designs, the USSR is taking the forward look—to learn now what the whole world must ultimately discover against the time when coal and its companion fuels no longer will be plentiful enough for the multiplying demands of power. We are doing the same thing in the United States.

The point is not whether they are ahead of us or we are ahead of them. They showed us things and we described things to them. I believe Americans are ready and willing to see more of what goes on elsewhere in the world, and to view quite objectively the accomplishment of others. Although Russia was largely a closed country for centuries, it seemed to us that we found a genuine desire on the part of the Soviets to learn of our experiences and to benefit from them.

Here, perhaps, is an opportunity and a mutual responsibility. There is much that we can do to raise our standards mutually. But, of course, if there is to be a fair and equitable basis, there must be give and take on both sides.

This way lies hope for the world.

I believe we *are* taking these steps together.

# *Impressions of Russia*

**By Elmer L. Lindseth**
*President, The Cleveland Electric Illuminating Co.*

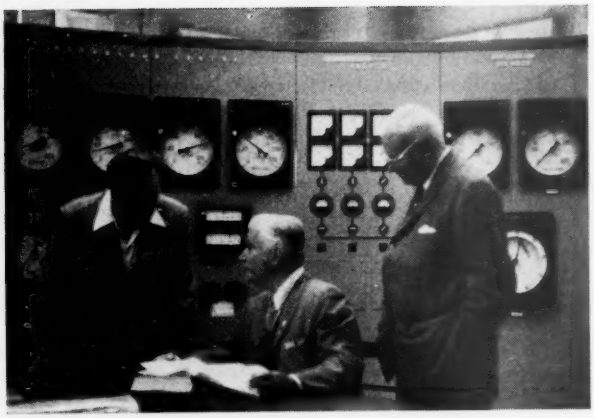
**This article is a condensation of a news letter which Mr. Lindseth sent to employees of his company following his recent return from Russia. In it he describes some facets of the Russian scene that he felt would be of interest to American utility employees.**

EVEN the most casual visitor cannot help but find interesting what he sees of Russian life.

Historically, Russian housing conditions have been unbelievably bad. Today they are improving somewhat, especially in the cities where one sees mile after mile of apartments, either newly built or under construction. But the Russian city dweller is still awfully cramped by almost any standards. Two families—sometimes more—share a kitchen and bathroom.

In the country, houses are often little better than hovels. Many are made of logs or sod. But here, too, improvements are being made, usually of the do-it-yourself kind. A little porch or the addition of a small room is the typical change.

Main city streets are wide and appear to be well-planned. Mass transportation is widely used and quite good. The people are not as well-dressed as Americans. Their clothes are not shabby, but the materials are of poor quality and the cut is unattractive. They are rarely pressed. Despite their drab attire, most of the people appear cheerful. They are earnest, polite and friendly. Seemingly they are hard workers, although they do not know leisure as we enjoy it in this country.



Mr. Cisler, center, and Mr. Lindseth, right, confer with Dr. A. K. Krassin, Soviet scientist, at USSR atom plant.

Their leaders have set a goal—catch up with the American standard of living—and they appear dedicated to this task. I can't see how they will succeed, however. Government just siphons off too much of the rewards of their labor.

Accommodations for the traveling public are of varying quality. Food is pretty good and hotels are pretty bad. Long-distance transportation is good. Much of the railroad system is electrified or dieseled, and the airliners seem well-constructed and fast.

Prices seem topsy-turvy to an American. Chocolate bars are $1.85 each; haircuts 20 cents; a shoe shine 30 cents. Rents are cheaper than here; clothes are more.

Women are to be found in virtually all occupations—they repair roads, drive buses, deliver mail, do nuclear research, operate and maintain power plants and work in line crews. In one generator factory women make up 40 percent of the work force. The construction superintendent of an apartment house being built was a young woman.

At home, the Russian has barely started to live electrically. Residential use of electricity is almost limited to lighting and radios. There are few TV sets, but no refrigerators, washers, ranges, food freezers, dryers, and the other appliances we take for granted.

All told, Russia's electrical generating capacity totals about 48 million kilowatts as compared to our 150 million kw. There is actually more generating capacity *under construction* in this country than exists in all of Russia.

The American utilities' expansion program is a source of amazement to the Russians. How, they want to know, can we find uses for that much power?

Their announced expansion plans are big. They have set a goal of 110 million kw by 1965, but this is probably an over-ambitious program. In recent years they have consistently fallen short of announced objectives.

This year the Russians dedicated what is said to be the world's largest hydroelectric plant—at Kuibyshev. But the plant took too long to build and cost too much. Future plans will emphasize steam power.

The vast distances of Russia make high-voltage transmission especially important. Much of the power used in Moscow is brought from as far as 600 miles away. This is like generating power in Minneapolis and transmitting it for use in Cleveland.

The highest voltage in regular use in Russia is 400,000, but they are planning 500,000-volt lines. They long have been experimenting with high-voltage direct current transmission, and expect soon to construct an experimental 800,000-volt d-c line.

While I was there I visited the only Russian nuclear plant in operation at that time, a relatively small one of 5000 kw. Since then, they have announced the opening of a larger one of 100,000 kw. This, however, is basically for the production of plutonium rather than power.

Russian nuclear policy appears to parallel the American program of research and development along many paths, rather than construction of plants for the mere sake of accumulating kilowatts. In the field of fusion or thermonuclear research—"harnessing the energy of the H-bomb"—their work also parallels ours very closely.

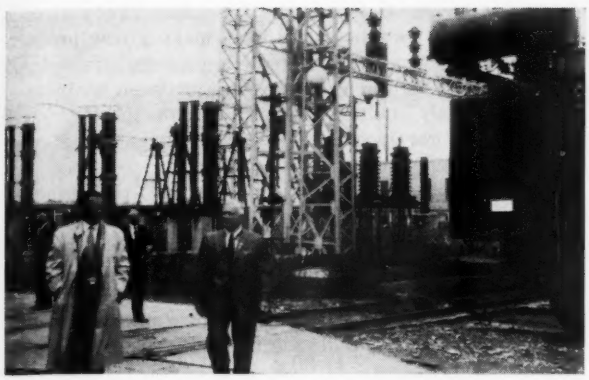
### Productive Capacity Expanding

Soviet industry is working to expand the nation's productive capacity. Workers are constantly urged to greater productive efforts. The Russian worker has learned there is only one way for any society, Communist or free enterprise, to improve its living standards, and that is to produce more and better goods. The Russian worker's productivity, however, is only a fraction of an American worker's. The tools and equipment he uses, as well as the product he turns out, are inferior to ours. Factory equipment and products alike are strictly functional.

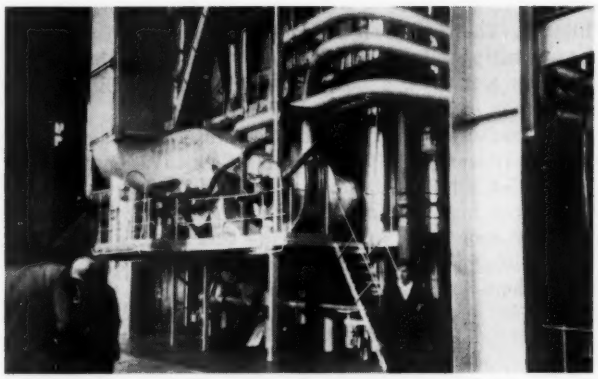
Housekeeping in factories is generally very slipshod and shabby. Safety practices seem poor.

What over-all impressions of Russia are the visitors to that country taking away? I feel sure that many, like myself, return with mixed feelings. There is a liking for the friendly Russian people. There is a respect for the determined manner in which this huge country, a technological desert half a century ago, has dedicated itself to scientific research and the intensive education of technical and scientific specialists. There is, perhaps, some surprise at the evidence of Russia's impending emergence as a major industrial power. Increasingly, I am sure, we are going to be up against stiff Russian competition not only in the world's political arena, but in the world's market as well.

Above all, there is the strange, stifled, anxious feeling that follows one everywhere in a country with no free speech, no free press, no political freedom, no free elections. It is the heavy weight of a totalitarian system which is dedicated to wiping the ideas of individual liberty off the face of the earth.



The delegation from the United States visits a Russian substation as part of its tour of power installations.



Moscow steam station is toured by the American utility representatives and manufacturers while in the USSR.

# *The Russian System and Ours*

**By Edwin Vennard**

*Vice President and Managing Director,*
*Edison Electric Institute*

THE government (in the USSR) owns all factories, all plants, all commercial stores. Every function in Russia is a function of the government. Every operation is a government operation. Everyone who works, works for the government.

I saw a lady operating a lemonade stand and thought surely she must have made her own investment in the stand. But no, the government owns the stand and the lemons and the lady gets a salary, plus a bonus. It was a government project.

We visited the Planning Commission and the top planners told us how they plan all the developments in Russia—how many steel mills, how many power plants, how many textile mills, and where to put them. It is run in much the same way as we ran our economy during World War II. We turned over most operations to the government; the government planned and ran the economy. After the war most of the operations were turned back to the civilian economy.

Russia relies on government planning and the Russians believe that's the best way to bring about the greatest good for the people. That's their belief and they believe in it firmly. I got no impression of any dissatisfaction with their lot on the part of the Russian people. They're proud of their system, and they're working very hard—and achieving something. They still have a long way to go before they will even approach the productivity of our economy.

The average turbine operator makes 1200 rubles a month—$120 a month at the over-the-counter exchange rate. With a good bonus he might earn a total of 1800 rubles. People making 1200 rubles in Russia live about like a man in this country making $120 a month. Some of our auto workers are making about $2.50 per hour. For a 40-hour week, that's $100 a week—three times or four times the average Russian wage. The pay of a young Russian engineer just out of college who goes to work in a plant is approximately $250 a month. The director—the man in charge of the plant—makes $400 or 4000 rubles a month. With bonus, the total may be 5000 to 6000 rubles. He also runs the town, which was built around the power plant. He runs the schools, factories, power plant and everything in the town including the houses. The director asked: "How much would you pay, in America, for a man like that?" We guessed at about $25,000 a year.

Russian workers are promoted "on merit." (The man who works hardest gets promoted fastest.) There are trade unions but no strikes. There is no bargaining for wages. All wages are fixed by the Ministry of Finance.

As near as I can judge, the Russians have adopted some of the principles of the capitalistic system. They have a bonus plan. Every plant has a bonus fund; the harder a man works, the more he gets in his bonus. If the power plant makes its quota, it gets a certain bonus; if it exceeds its quota, it gets a bigger bonus. We call it a profit. They call it a bonus.

The education system is important to the Russian economic system. In the little town of Cherepetz the director runs the schools. He took us all through the

school system. There is a kindergarten for the pre-school children. There are two different kinds of kindergartens, one operating 12 hours a day and the other operating 24 hours a day, on a boarding-school basis. The latter is handy in cases where both parents work.

The grade schools are much like ours. Following grade school, children go to middle school which is equivalent to our high school. All children are required to complete middle (or high) school. Then they are encouraged to work for about two years. During this time they get to see how tough it is to make money and get along. This makes them better students in college.

### Few Drop Out of College

Their college is called high school. About half the young people go to work and half go to college. Practically all the freshmen graduate. Few flunk or drop out. In our colleges we find students dropping by the wayside. This led me to question their admission standards if all their students finish. They use a selection system, coupled with strong incentives, that insures ability and motivation to complete the courses.

The Moscow University handles 25,000 students and occupies one of the largest buildings in Moscow. We were told that a top scientist earns the equivalent of $70,000 a year. It appears that the best pay is for scientists and teachers.

The Russians are using the strongest of incentives to get people to become teachers and scientists. Maybe that's one reason why they are able to develop so many scientists and engineers. Perhaps it's one of the reasons we aren't developing as many scientists as some people think we should. Maybe we haven't been smart enough as businessmen to see that American teachers are paid sufficiently. In Russia the teacher is highly regarded; really somebody.

It would behoove us to look into this question and to get the teachers' salaries up where they should be.

The Russian workers are enthusiastic about their system. There were women working everywhere, doing hard physical labor. They pave the streets, work on big machinery, build buildings. They receive the same wages as men.

The Russians' housing is poor. They have 60 square feet per person. We have in America 340 square feet per person. Russia is trying diligently to overcome the desperate shortage of housing. Everywhere in Moscow we saw new apartment buildings going up by the dozens. We were told that more apartment buildings had been built in Moscow in the past three years than in the previous 40 years. Russia plans to double its housing in 10 years.

Since coming back I am more convinced than ever that our system is the better way. And what is the difference? Russia isn't following the Marxist philosophy which advocates that each man shall work in accordance with his ability and shall receive in accordance with his needs.

The difference as I see it is this: Under the Russian system there is a complete planned economy—a "welfare state." Men in government run everything. Government owns and runs all business. They have "public ownership" of all business. Everyone is dependent upon the government. People are not free to move from job to job, or to strike, or to bargain for wages. They are not free to start a new business or to make a new product. They are not free to invest their savings in business enterprises. There is no competition between businesses, as there is only one manufacturer—one employer.

In Russia, government is supreme. I was told 95 percent of the people don't believe in God.

The system works, but, so far at least, the standard of living is about one-third of ours.

On the other hand we have here in America the kind of system under which each individual is encouraged to take care of himself without a planned economy or welfare state or top officials in government planning things for him and telling him what to do. We plan things for ourselves. At least it is the way our system was designed in the beginning. People are encouraged to save and to invest—so they can share, individually, in the business profits. Workers are free to change jobs, to move around, to strike, to bargain for wages. People are free to try something new, to take risks, to make a new article. Some fail. But, some succeed too.

There is competition here. A business must be run efficiently or a competitor will take the business.

In America, the people run the government. In Russia, the government runs the people.

Americans are a religious people.

These two ideologies are in mortal conflict today. That's the issue confronting the world. My observation is that Russia is gravitating, in some respects, toward our kind of system—away from Marx. In America there is a gravitation toward the Russian system—a gravitation toward the welfare state, the planned economy. Here, many Americans are calling upon their government to do for them those things which Americans, traditionally, do for themselves.

How do we stop this gravitation toward the Russian system?

The Russians teach their children, from kindergarten through college, that their system is best. All workers are constantly being taught that the Russian system is best.

We in the power business have seen the government going more and more into this business. Today, about 20 percent of all electric power is run by government. It is called "public ownership." The public "owns" it like the Russian public owns its power business and all other business. It is government ownership. It is the Russian way of doing business.

### No Power Shortage in America

There is no power shortage in America. All America's power needs can be met by the American methods.

In America we have 4,223 kwhr per capita as compared to 1,044 in Russia.

We have 150 million kw of power capacity in America, compared to 48 million kw in Russia. We have under construction for the next three years, 50 million kw.

We have learned, in America, that when people are informed as to business and economic facts, they are disposed to be in favor of the American way of doing things and are opposed to "government operation of business" and opposed to the philosophy of "government, please take care of me."

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**Mr. McAfee urges unification of all industries affected by government encroachment against our common problem, because "the disinterested spectator of today may well become the challenged protagonist of tomorrow."**

# *The Threat of Government Operations—* Our Common Problem

**By J. W. McAfee**
*President, Union Electric Co.*

IT is particularly appropriate that the program committee included the final phrase "Our Common Problem," when selecting the subject, "The Threat of Government Operations—Our Common Problem." It may be that the committee was thinking in terms of the community of interests of the gas and electric utlities in this connection and I, too, have that in mind.

### Participation in Gas Business Reduced

Our efforts to comply with the Holding Company Act greatly reduced our participation in the gas business and, though we are greatly interested in gas service to the few communities we still have, our dominant activities are in the electrical field.

Government operation of business is, however, a "common problem" of much broader scope than any of the industries thus far touched by it and, to my view, of great significance in charting the future strength of our country.

This issue must be viewed against a certain background. The United States has been populated by immigrants from what we call the "old country"—principally western and southern Europe—and their descendents. They had the same background and much the same talents as those who stayed behind. It is reasonable to assume that they were more venturesome and courageous and that they had the imagination and determination to strike off across the seas in search of a greater freedom than they could find at home.

These immigrants found great natural resources in this continent; however, there are also great natural resources near and south of the equator, which are either underdeveloped or have been developed in such a way as to bring no startling strength to the areas in which they are found.

My point is that for the United States, in the span of 170 years to have grown from a struggling federation of states into the dominant nation of the world, must be the product of some element beyond the talents of the people and the physical advantages which are available in America. It is perfectly clear to me that the concept of government written into our Constitution is the key to this great record of progress. It has demonstrated the startling effect of a free opportunity, with unlimited incentives, on the productive capacity of man.

Now this whole system is being challenged. In almost every field of human endeavor—military, economic, scientific, and the arts—a contrary philosophy is pressing for domination.

People, generally, appear to be quite conscious of the military pressure. Important as it is for us to remain able to protect ourselves, it is at least equally important that we retain the things that are so worthy of protection.

### Something for Nothing

The lure of the appearance of something for nothing is probably the strongest factor in the amount of public support given to the great variety of proposals that have socialistic features. Thus many of the concepts which become a part of our national policies are adopted with the support of people who have no desire to or intention of supporting Marxist principles. There is too little appreciation of the fact that these seemingly small steps do, in the aggregate, seriously weaken our capitalistic Republic and that the trend, if continued over a sufficient period, may carry us beyond the "point of no return."

Mr. McAfee, Past President of Edison Electric Institute, delivered this address before the Annual Convention of the American Gas Association, Atlantic City, N. J., Oct. 14, 1958.

Public service companies are particularly vulnerable to the "something for nothing" approach. Anything can be made to appear cheap if part of the cost is concealed. To require the customer of the private utility, gas or electric, to pay taxes and cost of money, and to free the customer getting service from a government operation from these payments, is almost a bribe for support of socialization. In addition, the deception is compounded by the use of such phrases as "yardstick" and "cheap service," etc. It is extremely difficult, if not impossible, to inform all of the public of the facts. There is reason to argue that a more simple, if less exact, approach is more effective.

For example: gas is produced, transmitted, delivered and used by well known devices. These devices must be operated and serviced by men and women. At the heart of the issue is the simple question: Can and will men and women work more efficiently in the framework of government or in a business organization. The answer discloses the most economical method of operation. I am sure the overwhelming majority will concede that business is the more efficient.

### Objective: Freedom

There is a perfectly good reason for this being so. The objective of our government is freedom—not efficiency. It is limited by checks and balances and other provisions for the protection of the individual. When these limitations are applied to the conduct of business, they become what we call "red tape."

On the other hand, the prime objective of a business company is useful, efficient and economical production.

There are so few people in this country who consciously subscribe to the ideology of socialism or communism that even if you lumped in all of the fellow travelers who to some degree are sympathetic, they will still represent so small a minority as to offer no appreciable threat to our system. That these people themselves recorgnize that fact is apparent from the devices they have adopted in fostering the proposals which are necessary to their program.

It is equally clear that the Marxists quickly recognized that if they were to bring the ownership of all productive facilities into ownership by the government, the first step was to obtain ownership of the basis of production, namely, the utilities.

Their first objective was the electric utilities. It was not until the gas industry had done a fine job with an important and basic part of our economy that it attracted their attention. There was little talk of socializing it until it had done the work and faced the risks of developing great natural gas reserves, designed and built the equipment to transmit and deliver it, the appliances to make its use productive, and, under appropriate regulation, reasonably profitable. It is only now, after all that accomplishment, that the big government adherent, prodded on by the true Socialist and Communist, finally becomes zealous to take over.

As you know, activities for government ownership of the gas business have grown rapidly in recent years. This Association (AGA) has called attention to the fact that from 1956 to 1957, municipal operations in the gas field grew in dollars of gross by 16 percent, while the privately owned industry increased only 7.4 percent.

The percentage increase in number of customers was even more alarming and in terms of units sold, was at least comparable. There is no question but that there will be a concerted effort to continue this trend and I anticipate that it will take very much the same course that has been followed in the attack on the electric companies.

There will be every denial that the objective is socialism. The reasons given to support the proposals will be far removed from the real objective. These proposals will not come directly from practicing Socialists. They will, in many instances, be put forward by men of good intentions who are merely following a pattern which was implanted on the public consciousness through the years.

Example: This spring, when we were confronted with the problems of employment and the growing recession, it was inevitable that the minds of thoughtful people, including our congressmen and senators, would be on the question of what could be done to correct the situation. Many anti-recession measures were offered to the Congress.

Among them was a proposal to increase the money available for building municipal gas distribution systems and other municipal services under public facility loans from $100 million to $200 million revolving funds. Provisions to increase the maximum terms of the loans from 40 years to 55 years and other very broad provisions, all designed to make it easy for agencies of government to go into business, were included.

Most of these bills are based on the same philosophy as was used so effectively against the electric companies during the depression of the early '30s. It was then that the ideas embodied in the WPA, PWA, etc. were sold to the American people. Many, and probably most, of those who supported the ideas were sincerely devoted to the purpose of improving economic conditions and failed to give appropriate consideration to the fact that there were plenty of opportunities available to assist the unemployed other than the establishment of a network of government ownership.

If I am correct in the assumptions I have been making, then it may be useful to you to review some of the events that have put the government in the electric business in a big way.

### Roots Go Back

The problem of government in the power business has roots extending far back to the start of this century. For years, the Socialist Party openly advocated government ownership of utilities and other businesses "vitally essential for the existence and welfare of the people," as the 1920 socialist platform put it.

Initially, the Socialist Party in America considered revolution by violence to be the method of instituting its program, but by the early '20's, the party adopted the technique of "encroaching control." A clue to the new approach was given by the Socialist Public Ownership League when its magazine reported in 1924 the success of a conference to draft suitable measures "for introduction in Congress providing for a "National Super Power System." The article said that "arrangements were made for the bill to be introduced in the Senate

by United States Senator George W. Norris and in the House by Congressman Oscar E. Keller."

This "super power" system would have involved the nationalization of all existing systems, including municipals, companies, and Federal hydroelectric installations.

But, as was pointed out in another Socialist publication, the *New Leader*, the party's "long-time aim is the abolition of the profit system for private use . . . we must force our experts on agriculture, trusts, coal, power, subways, housing, milk, etc., to tell us correctly what the next steps are . . ."

The first TVA bill (S. 2790) was introduced by Senator Norris in 1924 and provided for a nationwide, government-owned power system. Its plainly stated purpose was to put the government in charge of one of the nation's key industries. This was also alarming to a great number of people that the bill received virtually no support in Congress.

In 1926, Senator Norris tried again, this time limiting his bill to an electric power authority in the Tennessee Valley. Once more the bill was defeated.

### TVA Stressed 'Flood Control'

As finally passed in 1933, the TVA Act did not even mention electric power in its preamble, but laid great stress on flood control and improved navigation for the Tennessee River. Senator Norris and his socialist-minded sympathizers had not changed their aims, but they had come to the realization that if their major purpose of government in the power business were emphasized, the bill might be defeated again.

Today, TVA is the largest producer of electric power in the nation—and its largest consumer of coal. Today, about 82 percent of TVA's more than $2 billion investment is devoted to the production of electric power. And about 73 percent of TVA's electric power is generated not by hydroelectric dams, but by steam plants.

This was not contemplated in the TVA Act as passed —but it fits in only too well with the pattern which the Socialists developed years before. There has been a series of efforts since the TVA Act was passed to extend the "valley authority" concept across the nation. Whatever the political beliefs of the proponents of these authorities, the ultimate result, if they were ever to succeed, would be the nation-wide government-owned power system so ardently desired by the socialists. And that would be only the beginning, by their own admission.

TVA is by no means the only instance of something being other than it seemed where government and electric power are concerned.

In the field of rural electrification, the REA Act was passed in 1936. According to its terms, Federal government funds were to be made available for "rural electrification and the furnishing of electric energy to persons in rural areas who are not receiving central station service." In another part of the Act, the purpose is limited by definition to rural areas and towns of less than 1500 population.

Today, 97 percent of the nation's farm dwellings have electricity within reach and 96 percent are electrified. Of these, 43 percent are served by electric companies; 51 percent by rural electric cooperatives; and 6 percent by municipal utility systems and others. Sixty-six percent of the cooperatives purchase all or some of their electricity from power companies. In some areas, the electric companies serve all or almost all of the farm customers.

The fact that electricity is available to practically all of the farms in America has only meant to a number of REA cooperatives that they must seek expansion in other directions. They have set their sights on serving large population centers, endeavoring to get heavy industrial loads, and the building of generating and transmission facilities duplicating those of other suppliers. And they have to aid them the continued furnishing of Federal funds at below-cost interest rates, exemption from Federal taxes, and almost complete absence of regulation. These conditions can result in a waste of taxpayers' money, make the power companies less able to render good and adequate service at reasonable rates, and could ultimately result in socializing the American power industry.

Certainly there is nothing in the language or the apparent intent of the REA Act condoning or supporting the unfair competition which has developed from REA co-ops in various parts of the nation.

Nevertheless, the REA co-op movement is being used by those who are determined to establish a nationalized power system in this country. Clyde Ellis, general manager of the National Rural Electric Cooperative Association, made the cynical statement recently that "the power companies of the United States are not a part of our free enterprise system." He is calling for legislation that will set up government power districts, and permit the co-ops to expand without limit.

Where would the money come for this? From below-cost 2 percent Federal loans made possible by the taxpayers of the nation. Hence, the electric companies whose customers must bear the full burdens of taxation and cost of money, would be forced, in effect, to help finance their own competitors, who, in turn, are enabled to sell electricity far below its true cost to a favored few. Unfair discrimination of this kind can be another way to the attainment of the socialist goals.

One of the greatest weapons in the hands of those who seek the nationalization of the electric industry is the preference clause. This is yet another example of an act of legislation which has been distorted and perverted from its original apparent meaning to serve the purposes of those who would ultimately socialize the entire United States.

### Preference Clause First Used in 1906

The preference clause was first used in the Reclamation Act of 1906. At that time, electric power was not generally available to all customers as it is today. Under that Act, it was contemplated that incidental electric power might be generated from some reclamation projects. Since power was not generally available to all, the idea was to give preference to the use of this electricity for municipal purposes such as street lighting and water pumping. In those days, these uses of power seemed to be for the widest public benefit, and hence it appeared that they should have preference over other uses.

Beginning with the TVA Act in 1933, the meaning of the preference clause was changed. Under the new meaning, preference was not given for certain *uses* of elec-

tricity, but rather, preference was given to certain *organizations*—governmental bodies and cooperatives.

The distinction between the two preference clauses is that the earlier one established preference on the basis of the use to which power was put; whereas the later one established preference on the basis of the *type of customer* using the power. Thus the later one is clearly discriminatory.

Under this interpretation, governmental bodies and cooperatives, which are exempt from Federal income taxes and which are financed at a cost of money below the market price, have first call on power from Federal projects. This is a far cry from the non-discriminatory preference use clause of 1906.

The Federal power projects themselves do not pay proper interest and taxes, so their power is usually sold below a fair cost to the preference customers.

Thus the customers who purchase their power from electric utility companies are unjustly discriminated against by what is really a "discrimination clause," because the power companies are denied an equal opportunity to buy and distribute this government power.

In addition, the preference clause encourages other groups to set up tax-exempt organizations in order to "benefit" from the preference clause at the expense of the rest of the people.

The electric companies represent just one of many industries threatened with unfair competition from government threatens and co-ops which are not assuming proper financial responsibility.

Consider the competitive advantages of co-ops gained by their ability to retain earnings never subject to the Federal corporate income tax. J. E. Corette, President of EEI, noted recently that "while their corporate competitors are paying 52 per cent Federal tax on earnings, cooperatives are using their money to purchase new capital facilities, modern machinery and equipment, and for other purposes."

He stated that "it has been reliably estimated that cooperatives, mutual companies and other tax-exempt corporations would pay $990,000,000 in Federal income taxes if their earnings were taxed on the same basis as independent businesses.

### Huge Tax Deficiency

Similarly, we know from recent Edison Electric Institute studies that the tax deficiency of government power operations and REA cooperatives approximates $661,000,000 for 1956. This means that co-op and other tax-exempt enterprises and government power operations escape more than $1.6 billion in taxes yearly. This is only slightly less than the $1.8 billion dollars which investor-owned electric utilities paid in all taxes last year."

The proponents of government in business wrap their contentions in all sorts of appealing phrases and slogans. They sound good superficially but when carefully examined, they have little, if any, meaning. Example: Take the phrase "public ownership." What other kind of ownership is there? The public owns everything in this country, including the government. Almost the sole difference between investor ownership and government ownership is one of the freedom of choice to the individual.

A person has a free choice as to becoming an owner in the gas business. He can choose to accumulate savings and to invest them in any one of hundreds of fine gas companies. He can change his mind and switch to another company, or sell out entirely, if that is his desire. But when the government becomes the owner, then if the individual is a taxpayer, or prospective taxpayer, of government, he becomes an owner whether he wants to or not and he has no control, as an individual, as to how long he continues to be an owner.

It has been very difficult for the electric utilities to devise a program which will effectively inform the people of the true issues and of the ultimate importance to the country of how they are solved.

No doubt a great many mistakes were made but much has been learned from a cut-and-try method and some progress is being made. That this is so is supported by the tactics lately adopted by government ownership proponents.

### FPC Schedules Tax Hearings

Under pressure from Senator Kefauver and others, the Internal Revenue Bureau has, at least tentatively, taken the position that efforts to give our side of the story to the people through paid advertising media are not deductible for income tax purposes. The Federal Power Commission is to have hearings on whether such expenditures can be accounted for as costs of operation.

The governmental power agencies are continuing to spend large sums of public monies for propaganda in behalf of their activities. It will be unfortunate for the conduct of democratic government if the private companies are hampered and penalized in the efforts they are making to supply the answering arguments.

Through the years we have gone to many people for advice. In general, their response has been: "You have a great story to tell; all you need do is to get it over to the public." The difficulty is that it is a complicated story. It has none of the glamour of a promise of "something for nothing." If accurately set down, it makes rather dry reading and will not command the attention of the millions of people who should consider it.

I wish I had a ready-made program which I could offer to you. There is one point that I am sure is more important than any other. It is embodied in the title phrase "our common problem." We must unify those industries which are now being directly affected. There are more of them than you may at first suppose, but we need to go farther than that. It is necessary to get all business men to see that the disinterested spectator of today may well be the challenged protagonist of tomorrow.

Possibly some of you will feel that I am overly alarmed and that the extent of danger to our industries and to our country is not as great as I see it. If that should be true, I offer in extenuation that what we have to preserve is the envy of the world. It is the basis for our standard of living. It is the very heart of our privilege to expand as individuals economically, spiritually and culturally. Big government is the enemy of those things, as has been so clearly demonstrated by the Russians and the other Iron Curtain countries. Then, too, I am alarmed

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# Detroit Edison, Cisler Commended

*Electric Utility and Its President Are Cited for Outstanding Role in International Relations*

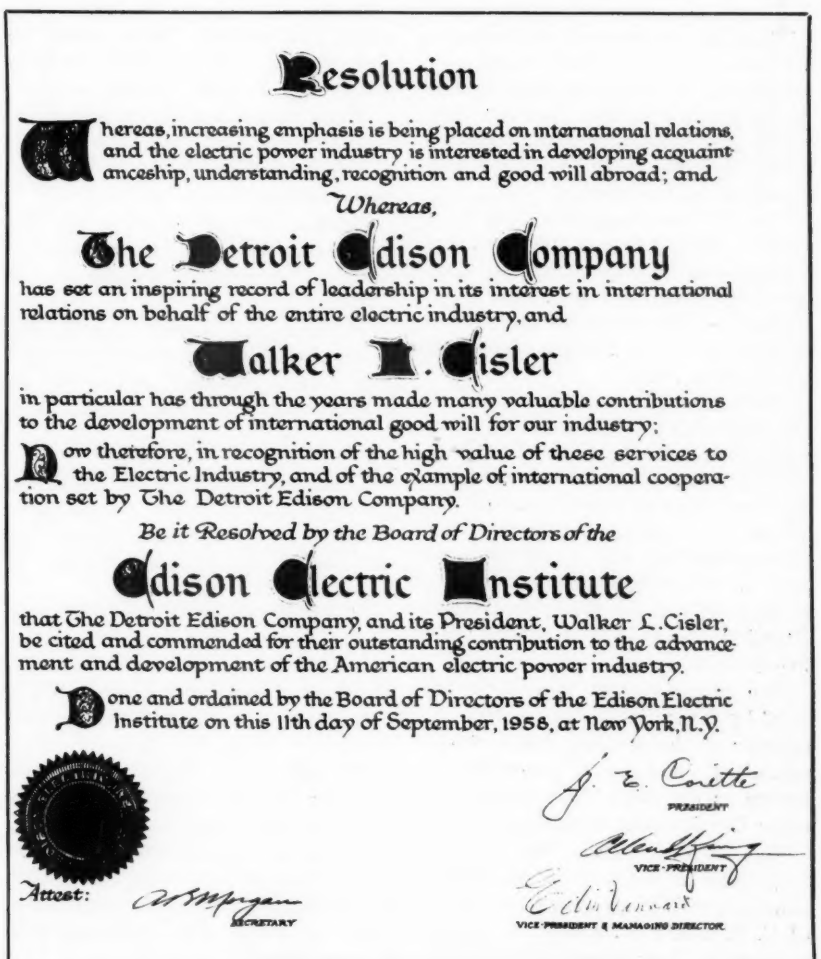
PRESENTATION of a unique award to The Detroit Edison Co. and its President, Walker L. Cisler, commending "their outstanding contribution to the advancement and development of the American electric power industry" in the field of international relations has been announced by EEI.

The award, presented at a stockholders informational meeting of The Detroit Edison Co. by J. E. Corette, EEI President, cites "the inspiring record of leadership" and "interest in international relations on behalf of the entire electric industry" of The Detroit Edison Co., and the "valuable contributions to the development of good will" for the industry made by Mr. Cisler.

In presenting the award Mr. Corette said: "The United States no longer exists in a vacuum; we are profoundly influenced by developments abroad." He pointed out that Mr. Cisler and Detroit Edison have served as official representatives of the United States at many international meetings on power problems. "By your attendance and your work," he said, "you have personally made a major contribution to development of electric power throughout the entire world."

"It is a very rare occurence," Mr. Corette said, "for the Board of Directors of the Institute to deviate from the established award program and by special resolution to honor a company or individual. Such a gesture of the industry's appreciation has occurred only infrequently in the history of the Institute. While the annual awards are made for outstanding contributions, awards made by special resolution of the Board of Directors are reserved for extraordinarily great achievements." It was such an award, he said, being presented to The Detroit Edison Company and Mr. Cisler.

Addressing Mr. Cisler, Mr. Corette said: "The work you have done on behalf of the United States and of the electric power industry in international affairs is a monument to your personal devotion and to your company's serious interest in fulfilling its responsibility to the industry, the nation, and the world."



Resolution

Whereas, increasing emphasis is being placed on international relations, and the electric power industry is interested in developing acquaintanceship, understanding, recognition and good will abroad; and

Whereas,

The Detroit Edison Company

has set an inspiring record of leadership in its interest in international relations on behalf of the entire electric industry, and

Walker L. Cisler

in particular has through the years made many valuable contributions to the development of international good will for our industry;

Now therefore, in recognition of the high value of these services to the Electric Industry, and of the example of international cooperation set by The Detroit Edison Company.

*Be it Resolved by the Board of Directors of the*

Edison Electric Institute

that The Detroit Edison Company, and its President, Walker L. Cisler, be cited and commended for their outstanding contribution to the advancement and development of the American electric power industry.

Done and ordained by the Board of Directors of the Edison Electric Institute on this 11th day of September, 1958, at New York, N.Y.

J. E. Corette
PRESIDENT

VICE-PRESIDENT

VICE-PRESIDENT & MANAGING DIRECTOR

Attest:

SECRETARY

## PUAA Folder Available on Advertising Motives

A folder, "Why Public Utilities Advertise," is available from the Public Utilities Advertising Association, Box 88, Philadelphia 5, Pa. It tells why utilities advertise — to inform the public on the best use of the service; to increase sales of its product; to inform the public about the company and its plans; to improve its company image; to encourage area development, and to attract investors' money and confidence.

***HTRDA Submits Proposal to AEC to Construct a Gas-Cooled Plant***

# Biggest U. S. Nuclear Group Formed

THE Philadelphia Electric Co. and more than 50 other electric utility companies representing all sections of the United States have offered to develop and build a high performance nuclear power plant which will provide a major short cut to the nation's goal of economic electricity from the atom.

The offer was made in a formal proposal submitted to the Atomic Energy Commission in response to the Commission's Sept. 22 invitation to industry to undertake the building of a high temperature, gas-cooled nuclear power plant.

The prototype plant, which the utility companies propose to build, is the high temperature, gas-cooled (helium), graphite-moderated reactor system conceived by General Atomic Division of General Dynamics Corp. The system has been under intensive theoretical and experimental development with private funds at General Atomic's Laboratory over the past two years.

The proposal was filed with the AEC by the Philadelphia Electric Co., sponsor of the project, and a newly-organized non-profit organization known as the High Temperature Reactor Development Associates, Inc.

The HTRDA, which has been incorporated in Delaware, is the largest and most widely representative group of U. S. utility companies to support a single nuclear power project thus far.

Announcement of the organization of HTRDA and the filing of the proposal with the AEC was made here by R. G. Rincliffe, President of Philadelphia Electric, on whose utility system the proposed prototype plant will be built and operated. Philadelphia Electric will own the plant. The actual site for the plant, which is scheduled to be completed in 1962 or early in 1963, will be announced soon.

The proposal calls for development, design, construction and operation of a plant of 40,000 electrical kilowatts capacity, although in its initial operating and testing phase, using its first nuclear core, the plant will have a capacity of about 30,000 kw.

Three companies will be principally responsible for the prototype plant:

The Bechtel Corp. will be the engineer-constructor.

General Atomic Division of General Dynamics Corp. will be responsible for the nuclear portion of the plant.

Westinghouse Electric Corp. will be responsible for the plant's electric generating system, including the turbine and associated equipment.

### To Cost $24.5 Million

Construction cost of the plant will be $24.5 million under a fixed price contract by Philadelphia Electric and the other utility companies of HTRDA with Bechtel Corp.

In accordance with the offer contained in the AEC's Sept. 22 invitation to industry to submit proposals, government assistance is requested in support of research and development costs.

The offer of the utility companies to build the developmental prototype plant is contingent upon the AEC agreeing to contribute to further research and development costs, both pre-construction and post-construction, under a direct AEC contract with General Atomic.

General Atomic proposed, under a cost price contract with the Commission, to fix a ceiling of $14.5 million on the research and development costs to be contributed by the AEC.

The entire cost of building the developmental prototype will be borne by the sponsor, Philadelphia Electric, and the other utility companies comprising the High Temperature Reactor Development Associates.

The proposal filed with the AEC stated that the development of the high temperature, gas-cooled reactor and the construction and operation of the prototype plant "will be a significant and substantial step toward achievement of economically competitive power."

The proposal said that "this type of reactor embodies all the characteristics necessary for the attainment of this goal" and identified, among such characteristics, the following:

1. Simplicity and compactness.
2. Use of inexpensive construction materials with a resultant lowering of costs, particularly in larger size plants.
3. High steam pressures and temperatures, resulting in high thermodynamic efficiency and permitting the use of the most modern steam turbine equipment.
4. Low fuel cycle costs arising from a high degree of burnup of the nuclear fuel.
5. Good nuclear economy.

Other characteristics of the General Atomic high temperature, gas-cooled reactor system cited in the proposal to the AEC include the system's extraordinary degree of inherent safety.

Mr. Rincliffe, in discussing the proposal, said:

"For nuclear power to succeed in competition with conventional power sources, which normally use fossil fuels, we must set about developing nuclear plants designed to conform to modern-day steam conditions, in terms of working temperatures and pressures. That is what we now propose to do.

"The high temperature, gas-cooled, graphite-moderated reactor system of General Atomic Division, and particularly its homogeneous fuel elements, appears to give great promise of meeting the basic requirements for a truly major advance in reactor technology and economics. These prospects of being able to move rapidly toward the objective of economic nu-

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# Analysis of Fatal Accidents

## *in the Electric Light and Power Industry in 1957*

**By S. H. Young**
*The Hartford Electric Light Co.*

ALTHOUGH the general trend in number of fatal accidents to employees in the electric light and power industry has been downward over the years, it has not been a constant, smooth descent. The total fatal accident curve (Figure 1) indicates the annual fluctuations with no two years in succession showing improvement over the previous year. The second curve showing electric shock and burn fatalities very closely parallels the total curve. From these curves it is obvious that effort must be exerted on reducing electric shock and burn accidents to materially improve the industry's fatal accident record.

The review and classification of fatal accidents is compiled from detailed reports submitted to the Edison Electric Institute by the companies where the fatal accidents occurred. For 1957 there were 116 known fatalities and detailed reports received on 112 cases.

Figure 2 shows months of the year when electric shock and burn accidents occurred. June, with 21, was high and May and July were next with 11 and 10, respectively. This leaves little doubt in regard to critical need for extra precautions during the hot weather months.

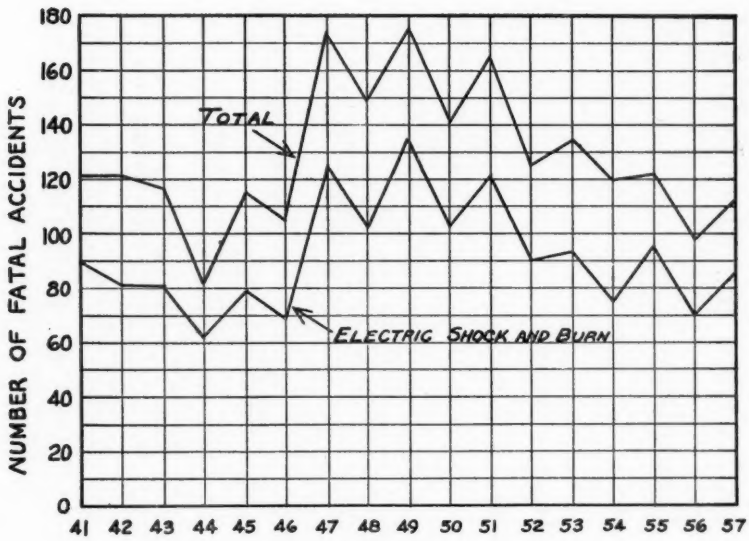


*Figure 1*

Table 1 shows the total number of fatal accidents that occurred in each of the last 17 years and also the yearly totals broken down according to types of accidents. In 1957, 86 of the 112 accidents, or 76.8 percent, were due to electric shock or burn.

Compared to the 17-year average, electric shock and burn cases in 1957 were up 5.4 percent, falls were down 1.6 percent, struck-by cases were down 2.5 percent, non-electric burns were up 1.9 percent and caught-in, drownings and others were not far off from the average.

Although the 112 fatalities experi-

TABLE I—SEVENTEEN YEARS OF FATAL ACCIDENTS IN THE ELECTRIC LIGHT AND POWER INDUSTRY—1941 TO 1957 INCLUSIVE

(From EEI Accident Prevention Committee Summaries based on detailed reports received.)

| *Year* | *Total* | *El. Shock or Burn* | *Falls* | *Motor Vehicles* | *Struck By* | *Burned* | *Caught In* | *Drowned* | *Miscellaneous* |
|---|---|---|---|---|---|---|---|---|---|
| 1941 | 121 | 90 | 11 | 8 | 4 | 2 | 3 | 1 | 2 |
| 1942 | 121 | 81 | 19 | 11 | 6 | 3 | 0 | 0 | 1 |
| 1943 | 117 | 81 | 14 | 3 | 7 | 5 | 1 | 3 | 3 |
| 1944 | 82 | 62 | 6 | 5 | 6 | 1 | 2 | 0 | 0 |
| 1945 | 116 | 79 | 14 | 6 | 5 | 4 | 3 | 3 | 2 |
| 1946 | 105 | 68 | 19 | 8 | 5 | 0 | 2 | 2 | 1 |
| 1947 | 173 | 125 | 20 | 8 | 13 | 3 | 2 | 1 | 1 |
| 1948 | 149 | 102 | 21 | 13 | 6 | 2 | 2 | 0 | 3 |
| 1949 | 176 | 134 | 16 | 13 | 6 | 1 | 5 | 1 | 0 |
| 1950 | 141 | 102 | 13 | 9 | 4 | 4 | 0 | 5 | 4 |
| 1951 | 165 | 121 | 21 | 8 | 4 | 4 | 1 | 5 | 1 |
| 1952 | 125 | 90 | 7 | 17 | 4 | 0 | 1 | 1 | 5 |
| 1953 | 134 | 93 | 18 | 12 | 6 | 1 | 0 | 0 | 4 |
| 1954 | 120 | 75 | 17 | 14 | 6 | 0 | 2 | 0 | 6 |
| 1955 | 122 | 95 | 12 | 0 | 5 | 2 | 1 | 3 | 4 |
| 1956 | 97 | 70 | 10 | 6 | 4 | 2 | 2 | 3 | 0 |
| 1957 | 112 | 86 | 11 | 6 | 2 | 4 | 1 | 1 | 1 |
| 17-YEAR TOTAL | 2176 | 1554 | 249 | 147 | 93 | 38 | 28 | 29 | 38 |

DISTRIBUTION OF ACCIDENT TYPES
(By Percentages of Total Accidents)

| | *1957* | *17-Year Average* | *17-Year Range Min.* | *Max.* |
|---|---|---|---|---|
| Electric Shock or Burn | 76.8 | 71.4 | 62.5 | 77.9 |
| Falls | 9.8 | 11.4 | 5.4 | 18.1 |
| Motor Vehicles | 5.3 | 6.8 | 0.0 | 13.2 |
| Struck By | 1.8 | 4.3 | 1.8 | 7.5 |
| Burned | 3.6 | 1.7 | 0.0 | 4.3 |
| Caught In | 0.9 | 1.3 | 0.0 | 2.8 |
| Drowned | 0.9 | 1.3 | 0.0 | 3.5 |
| Miscellaneous | 0.9 | 1.7 | 0.0 | 5.0 |

# Review and Classification of 112 Fatal Accidents Reported during 1957 within the Electric Light and Power Industry—EEI Accident Prevention Committee

*(This summary was compiled from detailed reports submitted to the Institute. Total fatalities reported for 1957—116; total reports received—112.)*

| | | | | PATH OF CURRENT: VICTIM ENTRY | VICTIM EXIT | EQUIPMENT ENERGIZED | EQUIPMENT GRD. OR 2ND CONT. | VOLTAGE | OCCUPATION | | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L-Wrist | Abdomen | Sec. Wire | Neutral | 120- | Foreman | 1. | Made contact on secondary wire with wrench while leaning body against neutral. |
| | | | | L-Hand | R-Hand | Pri. Wire | Guy | 2300-4000 | App. Lineman | 2. | In error, attempted to connect live primary wire instead of primary neutral to down guy. |
| | | | | L-Hand | R-Foot | Pri. Grd. Lead | Pole Grd. | 2400-4160 | Lineman | 3. | Cut transformer primary ground lead. Put himself in series with pole ground. |
| | | | | L-Hand | R-Foot | Trans. Riser | Arrester Grd. | 4160-7200 | Lineman | 4. | Removed rubber gloves to work on secondary. Did not put them on when he resumed work on primary. |
| | | | | Hand | Foot | Pri. Wire | --- | 6900- | Lineman | 5. | Making up loop on de-energized primary wire. Made contact on energized wire dead ended on pole. |
| | | LINE WORK | HANDS | L-Hand | Thigh | Pri. Wire | Pri. Wire | -7200 | App. Lineman | 6. | Contacted primary which had been switched out but which was still alive from backfeed. |
| | | | | Hand | Hand | Pri. Cutout | Guy | -7200 | Lineman | 7. | Reached out and touched bottom of cutout which had just been made alive. |
| | | | | L-Hand | R-Leg | Phase Wire | Pole | -12000 | Lineman | 8. | Removing X-arm. Raised it into primary while positioning same for lowering. |
| | | | | L-Hand | R-Foot | Pri. Wire | Trans. Case | 7200- | Lineman | 9. | Replacing transformer. Forgot to put rubber gloves back on to remove rubber goods. |
| | | | 24 | L-Hand | L-Foot | Trans.Neut.Tap | Pole | -12000 | App. Lineman | 10. | Contacted transformer neutral lead which had become disconnected from ground. |
| | | | | L-Hand | L-Leg | DE Clamp | Neutral | 7200-12000 | Sub. Foreman | 11. | After de-energizing trans., removed rubber gloves. Attempted to hook hand line sheave onto pri. dead-end clamp. |
| | | | | L-Hand | Foot | Pri. Wire | Pole | 7200-12000 | Lineman | 12. | Transferring circuits to new pole. Contacted energized primary. |
| | ELECTRIC | ON | | L-Hand | L-Foot | Pri. Wire | Eye Bolt | 7200-12000 | Lineman | 13. | Attempted to change transformer taps without de-energizing the transformer. |
| | | | CASES | R-Hand | L-Leg | Pri. Tap | Sec. Wire | 7200-12200 | Lineman | 14. | Through misunderstanding, man started work before line was de-energized. |
| | | | | L-Hand | R-Arm | Recloser Term. | X-arm Brace | 7200-12470 | Electrician | 15. | In primary area, on ladder to get name plate data from recloser. Made contact. |
| | | | | R-Hand | L-Leg | Dn Clamp | Neutral | 7200-12500 | Lineman | 16. | Tightening dead-end clamp with wrench stick. Placed hand too high and touched ferrule on tool end. |
| | | | | L-Hand | R-Foot | Hot Stick End | Sec. Rack | 7200-12500 | Lineman | 17. | Hand touched metal head of hot-line tool while installing "stirrup" on line. |
| | | POLES | | L-Hand | R-Side | Disc. Switch | Guy | 7200-12500 | Lineman | 18. | Climbed into position to open fuse-type switch. Did not wait for switch stick. |
| | | | | R-Hand | L-Foot | Pri. Neutral | Ser. Cable | 7200-13000 | Lineman | 19. | Opened transformer primary neutral. Completed circuit through body. |
| | SHOCK | | | R-Hand | L-Hand | Cutout | X-arm Brace | 7600-13200 | Lineman | 20. | Man assumed line was dead. Attempted to remove fuse by hand and not with hot stick. |
| | | | | R-Hand | Feet | Trans. Lead | Pole | 7600-13200 | Lineman | 21. | Changing transformer taps to get proper secondary voltage. Forgot to pull primary fuse on transformer. |
| | | | | L-Hand | R-Leg | Trans. Tap | Neutral | 7620-13200 | Lineman | 22. | Misunderstood that line was to be made not. Attempted to connect transformer tap by hand. |
| | | | | R-Hand | Feet | Pri. Wire | Pole | 7600-13200 | Lineman | 23. | Line had been pieced out and re-energized. Made contact while rigging pole to raise transformer. |
| | | | | R-Hand | Chest | SL Jumper | Neutral | St.Lt.Circuit | Serviceman | 24. | Patrolling St. Lt. Circuit in trouble. Climbed pole on another circuit and contacted live jumper. |
| | | | | R-Arm | L-Hand | Sec. Wire | Sec. Wire | 110-220 | Serv. Helper | 25. | Pulling slack on secondary wire. Made contact on secondary wires. |
| | OR | 48 | ARMS | R-Elbow | R-Leg | Pri. Wire | Neutral | 2400- | Lineman | 26. | To shift position, reached up and grasped end of buck arm to steady himself. Made contact on primary. |
| | | | 6 | R-Arm | Body | Pri. Cutout | Pri. Cutout | 2300-4000 | Lineman | 27. | Connected lead to cutout with hot sticks. Then made contact on top of cutout while attaching second clamp. |
| | | | CASES | L-Arm | L-Leg | Tie Wire | Sec. Wire | 2400-4160 | Lineman | 28. | X-arm with insulator and primary fastened with loose tie. Contact made while uncoiling tie wire. |
| | | CASES | | R-Elbow | Legs | Pri. Wire | Pole | 2400-4160 | Lineman | 29. | While removing tie wire, made contact. Line hose had been pulled back to get at tie wire. |
| | | | | R-Arm | R-Leg | Pri. Wire | Neutral | -4800 | Lineman | 30. | Climbed pole and belted in at secondaries. Then moved up into primaries before rubbering up. |
| | BURN | | SHOULDER | L-Shoulder | R-Knee | Pri. Wire | Neutral | 2300-4000 | Lineman | 31. | Installing pole band for guy wire. Raised up against uncovered primary. |
| | | | | R-Shoulder | R-Shoulder | Hot X-arm Brace | Neutral | 2300-4160 | App. Lineman | 32. | While shifting wire to new pole, wire was rested on belt head energizing angle iron brace. |
| | | | 6 | R-Shoulder | L-Arm | Cutout Lead | Ser. Wire | 2400-4000 | Lineman | 33. | Leaned back into lead to fuse box while pulling slack on secondary service cable. |
| | | | CASES | L-Shoulder | L-Foot | Pri. Clevis | Sec. Wire | 2750-4800 | Lineman | 34. | Man belted off below 2nd gain double arms then leaned back into his safety belt and made contact. |
| | | | | Shoulder | Hand & Foot | Pri. Cutout | Trans. Case | 4160-7200 | Lineman | 35. | While reaching around pole with screw driver to move transformer hanger, made contact. |
| | | | | L-Shoulder | L-Foot | Pri. Wire | Grd. Wire | 7600-13200 | Lineman | 36. | Removed gloves and sleeves while on pole then moved up higher on pole and made contact. |
| | | | HEAD | Head | Feet | Conducter | Neutral | 7200-12470 | Lineman | 37. | In violation of instructions to stay inside of tower, injured climbed outside and raised up against hot wire. |
| | | | | Chest | Feet | Sec. Wire | Dead SL Wire | 120-240 | Lineman | 38. | While climbing through 21" space between secondary and multiple street light circuit, made contact. |
| | | | BODY | Chest | Leg | Pri. Wire | Grd. Wire | 2300- | Lineman | 39. | While shifting wires to relocated pins on arm, reached over uncovered primary and made contact. |
| | | | 5 | R-Side | L-Leg | Pri. Connector | Bracket | 2300-4000 | Lineman | 40. | While reaching, injured rubbed against line hose where split bolt connector was attached to wire. |
| | | | CASES | Chest | R-Foot | Tie Wire | --- | 2300-4160 | Lineman | 41. | Reached over X-arm to put blanket between conductor and insulator pin. Contacted tie wire. |
| | | | | L-Side | L-Foot | Series SL Wire | Sec. Wire | 7600-13000 | Lineman | 42. | Leaned against normally dead St. Lt. wire. Circuit alive from contact with primary two miles away. |
| | | | LEG | L-Thigh | Hands | Sec. Wire | Sec. Wire | 120-240 | Lineman | 43. | Repairing secondary trouble. Got between bare secondary conductor and common neutral. |
| 86 | | | 2 CASES | L-Knee | Foot | Trans. Riser | Trans. Case | 7200-12000 | Lineman | 44. | Shifted position. Knee pulled transformer neutral out of neutral bus. Riser assumed primary voltage. |
| CASES | | | UNKNOWN | --- | --- | Conductor | Pole | 32000-60000 | Lineman | 45. | 60 KV insulator broke allowing wire under pulling strain to fall on injured. Double Fatality. See #68. |
| | | | 2 CASES | --- | --- | Switch | Tower | 46000-66000 | Lineman | 46. | Circuit tagged and grounded out of service. Climbed tower and contacted live side of switch. |
| | | | LOST BAL. | L-Hand | Chest | Sec. Wire | Sec. Neutral | 120-240 | Lineman | 47. | Climber cut out, lost balance. Chest contacted bare service neutral as hand or arm contacted live secondary wire. |
| 76.8% | | QUESTIONABLE ELECTRIC SHOCK CASE. NOT DETERMINED IF CONTACT WAS MADE. | | | | | | 2400-4160 | Lineman | 48. | Changing position on pole. Wearing rubber gloves. No visable burns. |
| | | | | Foot | Foot | Energ. Water | --- | -2400 | Line Foreman | 49. | Stepped in water energized by live down wire to rescue a person. Electrocuted. |
| | | | | Hand | --- | Pri. Wire | Earth | 2300-4160 | Groundman | 50. | Primary wire on ground energized when transformer secondaries were connected to live secondaries. Backfeed. |
| | | LINE WORK | | L-Hand | R-Foot | Winch Cable | Earth | 2300-4160 | Lineman | 51. | While holding end of winch line, derrick contacted primary overhead when truck was backed up. |
| | | ON | | L-Arm | Feet | Pole Grd. Wire | Earth | 2300-4160 | Helper | 52. | Guy energized when mechanical jumper connecting system neutral and pole ground was removed. |
| | | | | R-Hand | Feet | Co. Tel. Wire | Earth | 2400-4160 | Lineman | 53. | Wire being pulled in caught on limb. Quick pull flipped wire up into primary. |
| | | GROUND | | Hands | Feet | Energ. Truck | Earth | 2400-4160 | Groundman | 54. | Bucket and control handles of Skymaster came in contact with primary. Attempted to board truck from ground. |
| | | | | R-Heel | L-Shoulder | Down Wire | Shrubs | 2400-4160 | Lineman | 55. | Walked onto fallen wire which had burned off and fallen in shrubs while repairing storm damage. |
| | | | | Hands | Feet | Snatch Block | Earth | 2400-4160 | Pole Crew Foreman | 56. | Crane boom in contact with primary. Snaton block on steel cable swung against victim. |
| | | | | Hands | Feet | Slack Wire | Earth | 4160-7200 | Groundman | 57. | Dead primary being removed, slacked down into energized primary three sections away. |
| | | | | Hands | Feet | Slack Wire | Earth | 4160-7200 | Groundman | 58. | SAME AS #57. Double Fatality. |
| | | 20 | | Arms | Knees | Pole | Earth | 7200-12000 | Groundman | 59. | role top contacted primary while being set. Man handling pole butt received shock. |
| | | | | L-Hand | L-Foot | Truck | Earth | 7200-12000 | Foreman | 60. | Tree trimming truck with brakes set rolled, allowing boom to contact primary. Attempted to mount truck to stop it. |
| | | CASES | | L-Hand | Feet | Winch Line | Earth | 7200-12000 | Helper | 61. | Injured holding winch line as truck with A-frame up was backed into Overhead line. |
| | | | | Hands | Feet | Digger Levers | Earth | 7200-12000 | Lineman | 62. | Operating earth boring machine from ground, raised boom into energized Overhead primary. |
| | | | | L-Hand | Feet | Energ. Truck | Earth | 7200-12470 | Lineman | 63. | Reached into truck for body belt at same time that truck derrick contacted Overhead primary. |

# Review and Classification of 112 Fatal Accidents Reported during 1957 within the Electric Light and Power Industry—EEI Accident Prevention Committee

*(Continued)*

| | | | PATH OF CURRENT | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | VICTIM | | EQUIPMENT | | | | |
| | | | ENTRY | EXIT | ENERGIZED | GRD. OR 2ND CONT. | VOLTAGE | OCCUPATION | DESCRIPTION |
| ELECTRIC SHOCK OR BURN (Cont.) | LINE WORK ON GROUND (Cont.) | | L-Hand | Feet | Winch Line | Earth | 7200-12470 | Lineman | 64. Top of truck boom contacted primary wire as injured had hold of winch line. |
| | | | R-Hand | Feet | Down Guy | Earth | 7200-12500 | Lineman | 65. Cut guy wire to install strain insulator. Slacked guy into primary on bottom arm. |
| | | | L-Hand | R-Shoulder | Energ. Grd. Wire | Grd. Wire | 7200-12500 | Lineman | 66. Old pole with ground wire being removed contacted primary. Injured holding pole at butt. |
| | | | Hands | Feet | Energ. Truck | Earth | 7960-13800 | Laborer | 67. Removing digging bar from truck when top of truck boom made brush contact on primary. |
| | | | L-Hip | L-Foot | Conductor | Earth | 32000-60000 | Foreman | 68. Pulling wire in under 60 KV line. Insulator on 60 KV line broke allowing wire to drop on injured. See #45. |
| | LINE WORK ON HOUSE TOP | | R-Hand | Knees | Pri. Wire | Pri. Wire | 6900-11800 | Lineman | 69. Riding on house roof to lift wires as it was being moved. Fell across circuit. |
| | LADDER TRUCK | | Body | Body | Pri. Wire | Sec. Wire | 6900-12000 | Serviceman | 70. Working from ladder truck clearing down primary. Got between primary and secondary wire. |
| | HYDRAULIC LIFT TRUCK | | Back of neck | R-Hand | Pri. Wire | Oper. Handle | 7200-12470 | Line Clear. Man | 71. Misjudged clearance while operating Skymaster and made contact on primary wire. |
| | TREE | | R-Hand | Back | Green Limb | Green Limb | 20000-34500 | Forester | 72. Cut tree limb off that was in contact with live wire. Completed circuit through body from limb to tree. |
| | | ENERGIZED BUS | Hand | Hand-Knee | Bus | Steel Tower | 6360-11000 | Repair Helper | 73. Climbed steel tower to remove temporary grounds. Entered energized area. |
| | AT STATIONS OR AROUND EQUIPMENT BUS STRUCTURES, ETC. 13 CASES | LINES-RISERS-LEADS | L-Hand | R-Hand | Conductor | Steel Struct. | 12700-22000 | Oper.-Repairman | 74. Cleaning insulators and transformer bushings. Exceeded working clearance. |
| | | | L-Hand | L-Leg | Trans. Lead | 2nd Lead | 13200-22900 | Electrician | 75. Measuring station ground grid resistance. Contact made on supposedly de-energized conductor. |
| | | DISCONNECT SWITCH | R-Hand | L-Hand & Ft. | Air Break Switch | Dead Side AB Sw. | 20800-36000 | Lineman | 76. Descending station structure. Made contact in adjacent energized section. |
| | | | L-Hip | Foot | Air Break Switch | Sta. Structure | 38000-66000 | Foreman | 77. After phasing out new transformer and de-energizing same, apparently forgot station bus was still hot. |
| | | MISC. EQUIPMENT | L-Hand | R-Hand | Fuse | Steel Struct. | 5000-8660 | Mechanic | 78. Carrying wrecking bar through substation yard. Made contact on station fuse. |
| | | | R-Hand | Feet | Fuse | OCB Case | 6900-12000 | Lineman | 79. Attempted to tie Hold Card on end of energized by-pass fuse. |
| | | FAULT CURRENT | Foot | Foot | Earth | Earth | -44000 | Lineman | 80. One blade of gang air break switch, when operated, fell on guy wire, setting up ground voltage gradient. |
| | | FLASH BURNS 5 CASES | --- | --- | --- | --- | -2300 | Operator | 81. Short circuit developed when 2300V pot transformer was tested with low voltage testing device. |
| | | | --- | --- | --- | --- | -2800 | Foreman | 82. SAME AS #81. (Double Fatality). |
| | | | --- | --- | --- | --- | 2300-4000 | Electrician | 83. Short circuit developed while freeing locking device on disconnect switch. |
| | | | --- | --- | --- | --- | 2300-4000 | Electrician | 84. SAME AS #83. (Double Fatality). |
| | | | --- | --- | --- | --- | -26000 | Electrician | 85. Testing insulation on dead CTs. Contacted energized CT in service. |
| | SERV.SHOP | EQUIPMENT | R-Hand | L-Hand | HV Bushing | HV Bushing | -4300 | Maintenance Man | 86. Checking regulator and regulator motor. Injured received shock when motor circuit was energized. |
| FALLS 11 CASES 9.8% | LINE WORK | FALL FROM POLE OR TOWER | | | Changing position - cutout. | | | Lineman | 87. Fell 35 feet from pole when gaff cut out upon striking knot. |
| | | | | | Pulled off balance. | | | Lineman | 88. Fell from arm when gin pole being lowered caught in glove pulling injured off balance. |
| | | 4 CASES | | | Changing position. | | | Lineman | 89. Getting into position on pole. Apparently lost balance while belting in. |
| | | | | | Fell due to heart attack. | | | Lineman | 90. Fell to ground from secondary position. Had resumed climbing after several previous heart attacks. |
| | | FALL WITH POLE | | | Pole broke off 2½ feet above ground. | | | Lineman | 91. Cut telephone wires which changed strain on pole causing it to break off. |
| | FALL WITH LADDER | | | | Ladder slipped - fell to concrete apron. | | | Maintenance Man | 92. Ladder insufficiently extended and not tied was placed on slanting spoke of gate. |
| | FALL FROM HYDRAULIC TOWER TRUCK | | | | Thrown from bucket. | | | Repairman | 93. Testing operation after repairing hydraulic line. Loss of fluid affected controls. |
| | FALL FROM CONSTRUCTION ELEVATOR - 100 FEET | | | | Caught between shaft and brace. | | | Elev. Flagman | 94. Assumed that flagman tried to leave elevator when it passed above top landing. |
| | LOST BALANCE | | | | Fell going inside building under construction. | | | Const. Foreman | 95. Started to step 43" down to inside floor from wall but lost balance and fell 63" to concrete dust outside. |
| | FALL IN ELEVATOR SHAFT | | | | At Power Station | | | Aux.Equip.Oper. | 96. Opened doors to elevator shaft with key as they were not operating automatically. Stepped into empty shaft. |
| | FALL THROUGH FLOOR OPENING | | | | At Steam Electric Station | | | Helper | 97. Sliding floor grating back in place after raising material. Stumbled and fell through opening. |
| STRUCK BY 2 CASES 1.8% | POLE | | | | Loading poles on trailer. | | | Material Man | 98. On top of load of poles, load shifted throwing injured to ground. Struck in head by pole butt. |
| | POLE | | | | Removing pole with truck derrick. | | | Foreman | 99. Pole with gang operated air break switch mounted swung up carrying injured with it. Pole fell on top of injured. |
| CAUGHT IN 0.9% | COAL CONVEYOR | | | | Arm caught between conveyor and housing. | | | Mill Oper. Mlpr. | 100. Injured working alone, was apparently removing foreign object from coal conveyor. |
| DROWNED 0.9% | PUMP HOUSE | | | | Fell into river. | | | Mtce. Mechanic | 101. Had gone to lower level in pump house to close a valve. Cause of falling unknown. |
| MOTOR VEHICLE 6 CASES 5.3% | ON HIGHWAY | | | | Head-on collision. | | | Manager | 102. Head-on collision with public car on straight-away. Weather clear, pavement dry. |
| | ON HIGHWAY | | | | Head-on collision. | | | Vice-President | 103. SAME AS #102. (Double fatality). |
| | COMPANY TRUCK PARKED OFF HIGHWAY | | | | Struck by other car. | | | Lineman | 104. Parked station wagon struck by other car that came around curve out of control. |
| | ON HIGHWAY | | | | Ran off highway. | | | Meter Reader | 105. On return trip from reading meters, apparently lost control of truck which ran off road. |
| | AT SIDE OF HIGHWAY | | | | Struck by passing car. | | | Serviceman | 106. Passing car crossed highway striking injured as he was entering truck, parked with signal lights on. |
| | AT RAILROAD CROSSING | | | | Struck by train. | | | Truck Driver | 107. Truck stopped at RR then started across and was struck by train. Vision limited due to curve in track. |
| BURNED 4 CASES 3.6% | METER SHOP | | | | Escaped gas ignited, engulfing shop. | | | Gen. Foreman | 108.) Contractor installing gas heaters in warehouse on main floor below Meter Shop. The |
| | " " | | | | " " " " " | | | Sr. Meterman | 109.) gas that escaped when plug on HP gas line was removed to connect service to heaters |
| | " " | | | | " " " " " | | | Sr. Meterman | 110.) was ignited by a hot water heater. The ensuing fire caused the death of four |
| | " " | | | | " " " " " | | | Meterman | 111.) employees. |
| MISC. | EXPLOSION | | | | Hydrogen gas cooled generator. | | | Electrician | 112. Fatally injured by hydrogen gas explosion. Generator casing not completely purged. |

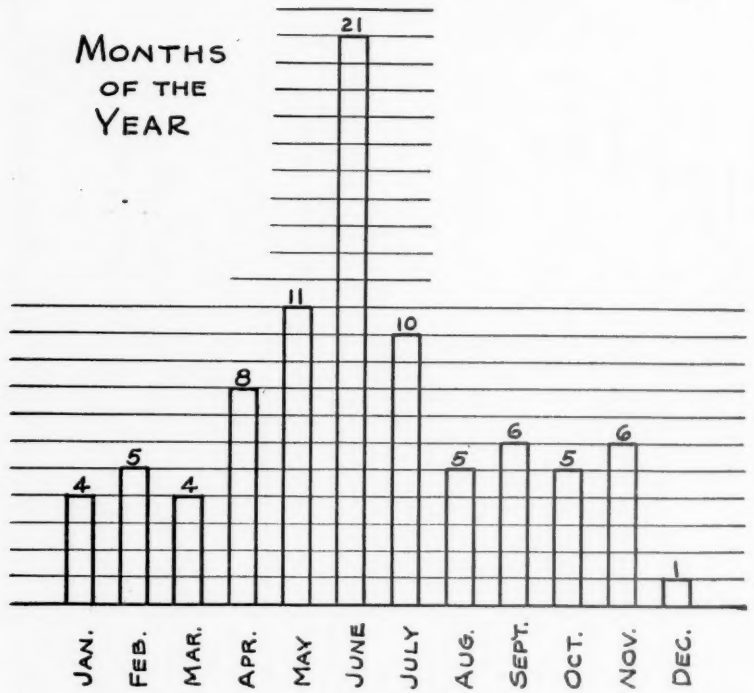


*Figure 2*

enced in 1957 was an increase of 15 over 1956, it was the fourth lowest for the 17-year period.

Figure 3 lists the electric shock and burn cases and among other things tells where the original contact was made.

From this summary it will be noted that electric shock and burn accidents were responsible for the largest percentage of the fatalities, 76.8 percent. It is therefore urgently recommended that everyone interested in and concerned with the welfare of our employees, especially our linemen, thoroughly study the individual cases as listed in this review and classification. However, "knowing is not enough"; we must put our "know-how" to work and eliminate the boobytraps, the short cuts and the "almost but not safe enough" methods that we have fostered and turned our backs on.

In 1957 the industry lost 61 linemen through fatal accidents. These men are hard to replace. They were highly trained specialists and very valuable employees.

In a few words the high points contained in Figure 3 are as follows:

Those cases under the classification "line work on poles" where contact was made while climbing or while in the working position, but without cutting out or losing balance, there were 24 hand contacts. This can only mean that rubber gloves were not being worn.

The other contacts listed under the same working conditions could have in most cases been prevented if proper covering of live wires with rubber protective equipment had been carried out and proper work position, that is, keeping below the work area, had been maintained.

The increased number of cases occurring while "working on the ground" is disturbing. In 1957 there were 20 such fatalities compared with nine in 1956. This includes five cases involving energized trucks and cranes. This compares unfavorably with 1956 as well as with the 10-year average of 11. Greater thought must be given to the protection of our linemen and groundmen while attending reels during wire-pulling operations and while working near trucks and operating pole-hole diggers that may make contact with energized wires overhead.

The electric shock and burn cases that occurred at stations and on or around equipment, buses, sub-stations and switching structures numbered 14. This was 10 cases less than the average for the previous

(*Continued on page* 400)

| | | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LINE WORK ON POLES — Contacts made while climbing or in working position but without cutting out or losing balance. | Hands | 24 | 28 | 25 | 26 | 26 | 14 | 25 | 27 | 16 | 24 | 235 |
| | Arms | 19 | 21 | 14 | 19 | 11 | 11 | 6 | 16 | 8 | 6 | 131 |
| | Head | 10 | 7 | 7 | 1 | 7 | 7 | 5 | 5 | 2 | 1 | 52 |
| | Neck | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 2 | 0 | 0 | 7 |
| | Body | 7 | 12 | 5 | 4 | 1 | 7 | 4 | 4 | 2 | 5 | 51 |
| | Shoulder | 0 | 0 | 0 | 4 | 3 | 4 | 0 | 4 | 4 | 6 | 25 |
| | Leg or Foot | 1 | 3 | 3 | 1 | 1 | 3 | 1 | 0 | 4 | 2 | 19 |
| | Unknown | 3 | 6 | 2 | 5 | 2 | 0 | 0 | 0 | 0 | 3 | 21 |
| | Flash | 0 | 0 | 0 | 2 | 1 | 3 | 3 | 4 | 2 | 0 | 15 |
| LINE WORK ON POLES | Gaff Cutouts | 2 | 6 | 3 | 5 | 4 | 2 | 0 | 0 | 0 | 1 | 23 |
| LINE WORK ON POLES | Slips & Lost Balance | 3 | 2 | 0 | 0 | 0 | 2 | 1 | 3 | 1 | 0 | 12 |
| LINE WORK ON POLES | Possible Heart Case | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| Line Work from Ladders | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Line Work from Hyd.Tower | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 |
| Line Work in Trees | | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 6 |
| Line Work on Ground | | 13 | 15 | 9 | 9 | 10 | 9 | 6 | 2 | 5 | 15 | 93 |
| Surveying | | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 3 |
| St. Light Replacement | | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 4 |
| Energ. Cranes & Trucks | | 0 | 0 | 0 | 3 | 1 | 2 | 0 | 3 | 4 | 5 | 18 |
| Underground | | 2 | 2 | 2 | 0 | 2 | 0 | 1 | 6 | 1 | 0 | 16 |
| In Basements | | 1 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 6 |
| TOTAL OF ABOVE | | 85 | 102 | 71 | 83 | 71 | 70 | 58 | 80 | 52 | 72 | 744 |
| AT STATIONS | | 17 | 32 | 31 | 38 | 19 | 23 | 17 | 15 | 18 | 14 | 224 |
| TOTAL | | 102 | 134 | 102 | 121 | 90 | 93 | 75 | 95 | 70 | 86 | 968 |

*Figure 3*

*Research by Electric Utilities—III*

# Transmission and Distribution, General and Non-Engineering, and Future Projects

**By Howard P. Seelye**
*Consultant, Research Projects Committee, EEI*

*(This is the third and last of a series of articles on what the electric power utilities are doing in research, based on a survey of research among EEI member companies.)*

### Transmission and Distribution

SINCE facilities for the transmission and distribution of the power generated accounts for about two-thirds of a utility's investment in its power system, it would be expected that a considerable amount of research would be going on in these areas. This is borne out by the total of 351 research projects that were reported to the survey as applying to those parts of the system lying between the power plants and the customers. These projects deal with stations and substations, transmission lines, distribution lines, transformers, relaying, and metering; to their component parts, their installation, their operation, and their maintenance. Some concept of the type and extent of this work may be gained from the following description of research projects under way or recently completed.

*Underground Cables:* Looking forward to the not-too-distant future when underground cables will be needed to operate at the extra-high voltages now in use for overhead transmission, a project sponsored by AEIC and EEI in cooperation with manufacturers, has been instituted to develop cable materials and designs suitable for voltages up to 400 kv.

The present considerable use of high-pressure, gas-filled cables for 138-kv transmission has led to several research projects in that field investigating application and control of the gas, the effect of severe load cycles on compound drainage and ionization potentials, possibilities of gas-pressure media other than the customary nitrogen, terminal bushing design, and the location of gas leaks.

For oil-filled, pipe-type cable which is largely used in 138-kv transmission, there is a project seeking to develop improved accessories for its filling and operation.

In lower voltage cables, there is considerable interest in the development of the use of certain of the plastics and synthetic resins for making cable joints, terminals, sheath joints, building entrances, etc. Six research projects are devoted to this subject. Five others cover related subjects including the use of rubber-like insulations, silicone insulations, preformed insulation for low-voltage cable joints, rubber joints over duct splices, and the like.

### Insulation Damage

There is a study of the insulation damage which occurs in cables due to the flow for a short time of high currents on the occasions of severe faults.

The use of aluminum conductors for cables and of aluminum for cable sheaths has offered interesting possibilities of economy and also a number of problems. These problems, particularly those concerned with the making of satisfactory joints in the conductors and in the sheaths, and with the installation of the cable both underground and as aerial cable, have had the research attention of seven companies.

A variety of developments in cable joints ranging from splice boxes for low-voltage cables to oil-stop joints in cables of higher voltage are reported in seven of the projects.

The life of lead cable sheath subjected to repeated bending is the subject of one study and the development of a long-life cable sheath that of another.

Aging characteristics of neoprene sheath-jacket is being investigated by one utility.

The development of improved tools and equipment for handling and installing cables is the objective of four projects reported. Another deals with arc-proofing of cables and one with the application of corrosion protection during installation.

One company has developed a special portable section of 34.5-kv cable for expediting repairs and maintenance work.

### Nine Corrosion Projects

The corrosion of cable pipes and cable sheaths is an important matter to all companies using underground cables. There are nine research projects devoted to studies of corrosion and corrosion prevention in its various aspects.

*Underground Conduits and Vaults:* Precast concrete conduits, manholes, and vaults offer certain possible advantages. Two projects are directed toward improved types.

A study of the relationship between the size of manholes and cable life leads to the determination of the most desirable manhole size.

An underground vault suitable for containing an aerial type distribution transformer is being developed, seeking to minimize the cost of underground distribution in residential areas.

A study of explosions in transformer vaults and means for their prevention is the important objective in one of the projects.

*Underground Transformers and Other Equipment:* One company reports its cooperation with the manufacturers in producing considerably improved designs for vault-type transformers.

A study of protective coatings for underground transformers occupies one project. A method of cleaning and painting them without removing them

from service is being developed by another.

Throw-over service in case of outages is particularly important when underground distribution is used because of the possibility of long outages otherwise. One company reports the development of improved methods and equipment for such automatic throw-over.

Participation in the development of improved equipment for use in connection with low-voltage cable networks are reported by several utilities.

*Stations and Station Equipment:* One of the difficult problems in distribution planning is that of finding suitable locations for substations. One company reports the development of an improved type of substation more acceptable to the public, which should be of assistance in this difficulty.

Substation bus construction has the attention of nine projects, seven of these dealing with the application of aluminum busses, two with copper bus joints.

In several cases, participation in the development of new or improved types of switching equipment were reported. One company has done extensive investigation of the suitability of various designs and makes of power circuit breakers, disconnecting switches, oil cut-outs, and power fuses by testing them at high fault duties on its system.

In one project, air compressor systems for circuit breakers were studied and a dehumidifying method developed.

### USA-European Program

There is a program under way to coordinate and standardize methods of rating circuit breakers between the USA and Europe.

A method of determining the condition of circuit breaker contacts without opening the breaker, by use of resistance measurements, is developed in one project.

Improvements in making ice tests on air-break switches by one company resulted in new approved national standards for forming ice in such tests.

A company is developing a guide for safe operation of air-break switches in breaking magnetizing and network load circuits.

More economical methods of block switching of capacitor banks is under study in one project. Three others are concerned with capacitor switching control, one of them by radio signal.

A study of transformer oil deterioration was reported by one utility, in cooperation with a manufacturer. Another is investigating the effect and possible control of water vapor in the nitrogen over the oil in power transformers.

The operation of its power transformers at the maximum feasible loading has an appreciable bearing on minimizing system investment. There are three projects devoted to the determination of maximum load capability and economic loading of such transformers.

### Internal Transformer Studies

Information on the internal condition of power transformers is important in detecting and preventing impending failures and in directing maintenance work. One company is developing determinants for analyzing the condition of transformer insulation. Another has originated a method of testing for internal faults, such as changes in ratio, without going into the transformer.

One project has been directed to the development of a piped, dry-chemical fire-extinguishing system for power transformers in locations where water is not readily available.

*Overhead Line Structures:* There are five projects dealing with variations from the ordinary in the design of transmission line structures including use of tubular steel members, concrete-filled steel pipe, aluminum members, short timbers, and a special design for installation on city streets.

Development of a pre-stressed concrete pile foundation for use in submerged locations was reported.

Determination of the condition of steel tower footings by electro-chemical tests, and means for protecting these footings, are the objectives of one study.

The possible eventual diminution of supply of wood poles and the desire for better appearance of lines has been the incentive in the studies in six projects of various substitute materials. One of these is looking at fabricated wood poles, three at fiber glass poles, and two at concrete poles, including pre-stressed concrete.

Preservative treatment of wood poles to prolong their useful life is of vital interest to nearly all utilities. Eight of them reported research on pole decay, on the effectiveness of various types of treatment, and on improvements in pole protection.

There is a project devoted to the development of a new method and equipment for determining the remaining useful life of partly deteriorated wood poles in service.

Improved methods of pole handling by mechanized equipment has been the object of one study; improved methods for setting poles in rock, of two more; application of machine-tamp aggregate for back-filling of poles, of still another.

Woodpecker damage to poles is a serious problem in some areas and two companies reported research projects to develop means for controlling it. Another is working on ways of discouraging starlings from congregating on utility structures.

Two companies have been making comprehensive studies of line clearance programs and of tree-trimming requirements. For many utilities the mounting annual expenditures necessary for this purpose are of serious importance. A comprehensive study of plant-growth control methods for application to trees is under way as an EEI-sponsored project.

Four utilities report projects to develop brush and weed control on their private line rights of way.

*Insulators:* There is a project for investigating the possibilities of using fiber glass instead of porcelain as a material for line insulators for better mechanical strength. A similar study relates to the use of fiber glass for strain insulators in place of wood.

### Porcelain Strut Insulators

The feasibility of porcelain strut insulators on high-voltage transmission structures is being investigated in one study.

Insulator contamination and the resulting current leakage or flashovers are problems of serious import in many localities, particularly where atmospheric contamination by smoke, dust, salt, or other chemicals and materials is severe. There are nine research projects reported as working on various means for preventing deposits on insulators or on removing such deposits.

*Line Conductors:* The use of multiplex cables for overhead secondaries instead of open wire is attractive from

the standpoint of appearance and reduction of line inductance. Two companies are studying this. The performance of bare aluminum wire secondaries is being investigated by another.

The objective of one study is to develop improved methods of replacing conductors on overhead lines.

Bundled conductors (two or more mechanically connected in parallel on each phase) is a feature of the very high voltage transmission lines as a means for controlling corona. They also have some application on lower voltage lines. Their characteristics is the subject of a research project.

### Infra-red Pyrometer

The Infra-red Pyrometer offers possibilities as a practical means for surveying the condition of conductor splices on overhead lines. This is being investigated by one utility.

Under certain atmospheric conditions trouble has been experienced from corrosion of the steel core of ACSR and also of copper-covered steel conductors. The causes and possible means for mitigating the damage are being studied in four different projects.

Conductor burndown by short-circuit currents initiated by lightning flashovers, foreign material across the line, or other causes, are a major cause of service outage. Two companies are investigating the characteristics of this phenomenon and possible preventive measures.

There are several research projects under way dealing with conductor splices of various kinds, particularly an EEI-sponsored project recently completed on the characteristics and behavior of connectors for joining aluminum conductors.

*Hardware and Line Accessories:* A number of companies report research study on certain problems in connection with line hardware, particularly those pertaining to corrosion and its prevention. They include investigation of various types of protective coatings and of aluminum as a substitute for steel.

*Distribution Transformers and Capacitors:* Methods of periodically estimating the load on distribution transformers by statistical means, thereby reducing the expenditures for load tests, is under study by four companies. A means of limiting the transformer load by cutting off certain high-current utilization equipment at a selected maximum demand, is reported in one project.

The development of a universal type of distribution transformer suitable for use either overhead on a pole, in an underground vault, or buried in the ground is listed.

Application of series capacitors to distribution primaries for voltage regulation is under study in one place. In another the use of series capacitors in connection with distribution transformers has been investigated.

*Tools:* There were 24 projects reported dealing with the development of various kinds of tools for handling and installing overhead line equipment. They aim toward greater mechanization, saving in time, and hence saving in cost.

*Miscellaneous Transmission and Distribution Items:* The reconditioning of transformer oil after service has the attention of four projects.

Four studies are directed to the important study of various materials and coatings for the prevention of corrosion. One of these evaluates over 200 different protective coating systems.

Improvement in work area protection for workers, pedestrians, and motorists is sought by one company.

The possible use of an insulated shield wire on a transmission line as a carrier path for supervisory control and communication is being investigated.

### Outage-free Service Planned

Outage-free service to important loads by high-speed transfer of service is one company's objective.

Maintenance of low-resistance grounds by the use of silica gel is a possibility under consideration in one project.

*Instruments and Testing:* In the field of instruments and testing, other than relaying and metering, there were 35 research projects reported. A number of these were concerned with various aspects of tracing and locating faults on the system. Another item of considerable interest is the measuring of voltage flicker occasioned by arc furnaces or large reciprocating devices, which tend to cause annoying disturbance to customers' lighting. Instruments for use in the testing of cables were the subjects of five of the projects and another was for measuring duct air temperatures on conduit profile surveys. The other 14 projects were devoted to various miscellaneous testing devices and instruments which will not be specifically enumerated.

*Relaying:* Many studies are going on all of the time on improvements in relaying application to particular systems. In the survey there were 17 projects reported which were considered to be of sufficient general interest to class them as research under our definition. One of these deals with improved carrier current relay protection for high-voltage cable lines. Another investigates relaying requirements on transmission directly by intentionally faulting the lines. There is a development of an original method of using relays to prevent the blowing of fuses by transient faults on distribution circuits. Several companies indicate participation with manufacturers in certain relay developments and improvements. Six studies were directed toward the production of equipment and devices for use in testing relays.

*Meters and Metering:* As with other types of equipment, research applied to meters themselves is largely carried out by meter manufacturers, but the utilities are directly concerned with the practical application and may also suggest improvements in the devices indicated by their experience.

There was reported a project for developing a method of compensated metering on the low-voltage side of a customer's transformer which would include transformer losses. Another study covered the metering of coincident demands for high-voltage/low-voltage service with compensation for different rates on the two services included. There was listed a project on a method of obtaining both varmeter and wattmeter indications from one meter, which would be useful on congested panels.

### Improved Meter Parts

A number of projects, 11 in all, were concerned with various improvements in details of meter parts and accessories. Fifteen more deal with developments in meter testing, inspecting, and processing through the utilities' shops.

One study has been investigating the feasibility of reading meters of rural customers at relatively long in-

tervals to reduce meter-reading cost. Another is looking into the possibilities of remote wattmeter reading, using carrier current for transmission of the readings.

The range and variety of research projects on transmission and distribution items which have been mentioned here indicate the opportunities in this field. They also are evidence that the utilities are well aware of the value and importance of such research and are active in it.

### General and Non-Engineering

In addition to the research having to do with specific parts of the power system, a considerable amount of research work was reported on more general subjects both of an engineering and of a non-engineering nature.

*General Engineering Subjects:* There were a number of interesting research projects listed which were concerned with engineering problems occurring on various parts of the system rather than being limited to one of the classifications used heretofore. Among these were:

An investigation of the causes and expected limits of land subsidence. Under certain subterranean conditions, severe land subsidence is possible and has occurred in a few places, endangering neighboring heavy structures.

A trial and evaluation of "electro osmosis" for stabilizing clay subsoil. Plastic clay can be a source of great difficulty in the construction of large structures.

Sonic method for testing concrete structures.

Protective coatings for concrete structures.

Weathering characteristics of wood by tests on sample panels.

Welded steel pipe by induction heating.

Embrittlement of steels.

Study of electrical insulation life and characteristics, and determination of most suitable methods for testing and evaluating it.

Effect of various substances used in connection with electrical insulation on its life and insulating value. This includes hand-creams, solvents, and taping compounds.

Investigation of the chemistry of ions in electrical insulating oils.

Development of means for increasing the life of oils for transformers, turbines, etc.

Several investigations and developments in the field of fire protection and fire extinguishment.

*Load Characteristics:* A great deal of research work has been done in the past and is still going on in the determination of the characteristics of various types of electrical loads on the system. As a basis for sales effort, for rate making, and for engineering planning it is essential that the behavior of loads served by the utility be well understood, both individual loads such as lighting, heating, refrigeration, etc., and group loads such as rural, residential, commercial, industrial, etc.

These studies deal with such characteristics as the hourly, daily, and seasonal variation of lighting loads, electric ranges, water heaters, air conditioners, electric house heating, and other electric applications, also of composite loads of lighting and small appliances, of various major appliances, etc. The diversity between loads is another matter of interest. They likewise investigate the characteristics of mass groupings of loads into load classes such as rural, light residential, heavy residential, small commercial, small industrial, heavy commercial, heavy industrial, and combinations of these in various proportions, to form area loads and system loads.

One interesting project is applying statistical sampling procedures to determine saturation and rate of growth of the use of a specific appliance such as television.

### Motorized Household Appliances

Another significant study seeks to determine power factors of standard motorized household appliances and to evaluate the cost of low power factor which produces increased power losses and voltage drop on distribution lines.

*Farm Electrification:* Although the use of electric power on the farm has become well established, there are still several research projects under way to develop new uses whereby manual work may be reduced.

*Air Conditioning:* There are 11 research projects devoted to various aspects of air conditioning and space heating. These deal with economic possibilities, characteristics, and effect on system load. There is an investigation of the economy of three-phase air conditioning for residential use, a development of humidity control air conditioning, and several studies of off-peak heat storage. The latter has recently become the subject of an EEI-AEIC jointly sponsored project.

Interest in the heat pump as an advantageous means of supplying year-around air conditioning has been steadily growing all over the country. Ten companies have reported studies of its operating characteristics, development, testing, and promotion for use in their local areas. In addition there are listed seven other research projects on various aspects of heat pump application.

### Field of Sales

*Sales Research:* Research in the field of sales is directed toward the development of sales-promotion programs which include specific studies of certain applications of electric power as possible loads, studies of the problems of various industries which might be solved by electrical applications, and participating in activities which might stimulate industrial growth in the area. There were 20 projects of this character reported in the survey.

*Economic Research:* Careful cost studies constitute an essential part of a utility's operation, serving in its determination of rates, its financing, its estimating of construction and operating requirements, and its engineering economic studies. Determination of true costs is a complex problem, involving the application of intricate theory and much experience. Research reported in this field has to do with such things as development of procedures and methods for determining the cost to serve various classes of customers; study of sources of cost on the various parts of the electric supply system; development of a generalized cost-to-serve formula; effect of increased fixed charges and improved generating efficiencies on the cost of operation; application of industrial engineering time studies to the determination of unit costs in construction.

Annual charges on investment are usually an essential factor in economic engineering studies. There are, however, no generally accepted standards for these charges. Research activities are reported on the determination of

depreciation rates, on loading (burden) rates on materials, and two projects on methods for determining the various annual charges to be used.

There is a study of the relationships between weather conditions and revenue forecasts.

Rate components, particularly those pertaining to new types of service, are sometimes subject to a considerable amount of research for their proper determination. One such study applied to 24-hour water heating is listed.

### Quarterly Billing Plan

A billing plan using quarterly meter readings is under consideration in one company.

The development of formulas for indicating when old equipment, such as transformers or transportation equipment, may economically be replaced rather than being further maintained, is sought by one utility. The economics of leasing equipment is another subject under study.

There is a project for determining the optimum warehouse inventory on certain construction items by the application of "operations research" methods.

*Electronic Computers:* The introduction in recent years of electronic computers has had a strong impact on the utilities operations in accounting, records, engineering, operating, and other fields. These machines offer many possibilities of increasing effectiveness and convenience, reducing manpower, and allowing problems to be solved which would be impracticable by other methods. The computers themselves are in a stage of rapid development, and their use is increasing steadily as more companies adopt them and as more useful applications are discovered. There are 14 research projects among the utilities directed at disclosing and developing the many possible applications of computers to the various problems of a utility's business.

An EEI-supported project for the study of the special computer requirements of utility accounting has recently been completed.

*Personnel Research:* Research in personnel relations is concerned with improving present methods and finding better means for selecting and placing employees; for their training; and for developing employee satisfaction. Some of the specific research projects reported in the survey were:

Development of a plan for scientific selection of supervisors.

Development of aptitude tests for highly specialized personnel.

Development of application of standard personnel tests.

Experiments in employee evaluation.

Study of the effect of automation on employee attitudes.

Development of mathematical sampling to ascertain job performance.

Development of work standards of performance and measurement in several categories.

Development of method of integrating performance and salary.

A course in "Principles of Management."

Study of objectives and principles of employee communication.

Establishment of a comprehensive executive health program.

Study of incidence of diseases of the lungs and bronchi among employees; of arthritis in industry; of alcoholism as an illness.

Study of accident-prone employees.

Study of ventricular fibrillation due to electric shock and means for overcoming it.

### 14 Management Projects

*Company Management Subjects:* Fourteen research projects listed seemed to be of a nature which would be of particular interest to management. Undoubtedly there are numerous similar studies going on in other companies which were not reported in this survey.

In the realm of business organization, there is a project on analysis of business systems, using charts, measurements, and graphical models. Another is concerned with business organization structure, including principles of organization, organization charting, and preferred titles. A third develops a management guide which, among other things, sets down objectives and policy statements.

A general analysis of the "planning function" is undertaken in one project.

The development of local economic indexes is the object of a study; an improved Utility Common Stock Index the aim of another.

The effect of security ratings and cost of money due to regulation, capital structure ratios, earnings coverage, and stability of the service area is dealt with in three projects.

One study seeks to develop basic criteria and measures of evaluation of the performance of a pension portfolio.

In two cases, methods of making definite comparisons between companies in regard to their engineering, operating, and financial performance are sought.

One company is determining and evaluating the factors which affect the location of work centers.

The long term effect of the St. Lawrence Seaway on its business is being studied by one system.

*Area Development:* Many utilities participate in and contribute to activities which are directed toward the improvement of the economy of their service areas, their business being, of course, responsive to such improvement. Although research of this kind is of a different character from that applying directly to the utility's own operations, it nevertheless should properly be included in a survey of research by the industry. Nineteen projects of this class were reported.

They will not be enumerated, but they cover such subjects as the development of the natural resources of the area, studies of water conditions and water conservation, both surface and underground, development of agriculture, study of land use, and the economic advantages of the area for business location.

In this and the preceding article (EEI BULLETIN, November, 1958) an attempt has been made to show the nature and the scope of research work which is now going on among the electric power utilities. It has not been intended as a complete catalog but quite a large proportion of the projects reported have been mentioned briefly as indicative of the character of this work. It seems evident that the existence of a large and fruitful field for research by the utilities has been fully established.

### Future Projects

The number, character, and scope of the research projects which have been disclosed by the EEI research survey as described in this and the foregoing two articles of this series should be conclusive evidence that EEI and its member companies are alive to

the need for adequate research. It should not be assumed, however, that this calls for an attitude of complacency, for a belief that everything is being done that needs to be done. Not only must the present rate of activity be continued but there are opportunities for coordination and expansion which may lead to advantage and economy.

*Individual Companies:* It may be expected that those companies which have been active in individual research in the past will continue their interest and will initiate new projects of a similar character, as time goes on and the older studies are completed. It would be helpful to the industry if more companies were to participate in this way, and there have been recent indications of an increasing interest in research among the member companies. On the other hand, there are good possibilities of coordination of efforts between companies on subjects of mutual or of general interest, thereby spreading the participation and relieving individual companies of some of the burden.

### Supplemental Survey

The Research Projects Committee is now making a supplemental survey of research projects which the companies might have omitted from the first survey or which they have started since that survey was made. The results of this new survey will be made available to EEI member companies as soon as it is completed. It is now known, however, that a substantial number of projects will be listed and that their nature will be, in general, similar to those in the first survey as have been here illustrated.

*Coordination:* There has not been a great deal of coordination of research activities among the utilities, even on projects which are seemingly identical. There are a number of subjects on the EEI list on which two or more companies are working on the same or related phases. There has undoubtedly been some overlapping and duplication of effort although, fortunately, there is no indication that this has reached excessive proportions. Companies do exchange information informally and the Engineering Committees of EEI have done much to keep their members informed and to promote interchange of ideas on matters of current importance.

The Research Projects Committee has initiated a service of information exchange on the research projects reported in its survey. A summary report from the sponsoring company on any of the 968 projects listed has been made available to any EEI member on request, giving them some basic information and at least the name of the sponsoring company from which it can get more details if desired. Up to the present, more than 2500 copies of these reports have been sent out.

It is believed that more specific inter-company collaboration may be feasible and desirable on certain of the projects. The EEI Engineering Committees, in cooperation with the Research Projects Committee, are giving some attention to how this may be brought about.

*Project Extension:* Some of the research studies being made by individual companies are of such a nature that their scope could probably be expanded considerably in order to be of greater value to the industry in general. This could be done by developing them into projects for sponsorship and financing by EEI as a whole. The Engineering Committees, which have heretofore acted as sponsors and directors of EEI projects, are giving specific consideration to this possibility. About 200 of the projects on the survey list have been suggested by their company sponsors as suitable for further cooperative action of some sort. It is likely that some proportion of these can be found worthy of such expansion.

*New Projects:* As the electric power industry continues to grow, new problems will continually arise which must be solved by research. Many of these will be of a similar nature to those now under way. Others will undoubtedly strike into new fields not now touched on. If the situation 20 years or more hence is envisioned, with loads more than four times as great as at present and still growing rapidly, it is almost certain that some rather radical new ideas must be introduced if systems are to meet the conditions practically and economically. For example, it seems unlikely that the size of generating units and of power plants can economically continue to get bigger and bigger or that voltages for main transmission can continue to go higher and higher. It is highly desirable that any changes which will be made eventually be foreseen as soon as possible and their introduction anticipated as present systems expand.

The Research Projects Committee and the Engineering Committees are taking steps to round up ideas for new research which should be undertaken in the near future, or for which preliminary investigation should be started, particularly those which would be more suitable for EEI sponsorship than for individual company attack. Any projects which may be so suggested will be considered by the Research Projects Committee and referred to the appropriate EEI group for study, recommendation, and development if they appear justified.

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## Report on Electrically Heated Schools

The EEI Electric Space Heating and Air Conditioning Committee has compiled a "Report on Electrically Heated Schools," in response to requests for information of this type.

The report contains the following information: name and location of the school, date of construction, number of classrooms, other rooms, and the installed connected load of the electric heating system. Schools in 22 states are listed.

A limited number of additional copies are available from Commercial Department, EEI, 750 Third Ave., New York 17, N. Y.

## Four Companies Approved for EEI Membership

The EEI Board of Directors has approved the following applications for membership in Edison Electric Institute of these companies:

Cape & Vineyard Electric Co., Yarmouth, Mass.; Plymouth County Electric Co., Plymouth, Mass.; New England Gas & Electric Association, Cambridge, Mass.; Island Light and Power Co., Block Island, R. I.

Affiliate membership was approved of Canadian International Power Co., Ltd., Montreal, Canada, and Quebec Power Co., Quebec, Canada.

# Meter and Service Committee Meeting

- *Economics of Revenue Collection*
- *Savings of 2½-Element Meters*
- *Revision of MSJ-10, Part II*

By F. A. SALMON
*Chairman*

APPROXIMATELY 80 members, correspondents and guests convened at the Driscoll Hotel in Corpus Christi, Texas, Sept. 22-24, for the joint meeting of the AEIC and EEI Meter and Service Committees. The meeting was devoted to the discussion of new developments in meters and metering equipment; development and review of joint industry standards concerning metering; presentation of subcommittee reports; and round table discussions on the engineering, economic, and operation aspects of revenue metering.

At the Monday morning session manufacturers described and displayed new types of meters, metering instrument transformers and metering accessory equipment. On Monday afternoon the four subcommittees met independently to discuss their various subjects and formulate their reports. K. S. Field acted as chairman of Subcommittee I on Service Equipment in the absence of T. J. Pearson; W. D. Lindsay conducted the meeting of Subcommittee II, Meters and Metering Equipment; W. H. Farrington, chairman of the Subcommittee III, Codes and Rules, moderated this session; and G. W. Gerell conducted the meeting of Subcommittee IV on Meter Department Management.

At a joint luncheon of the committees on Monday, G. W. Gilliam, Vice President of the Central Power and Light Co., welcomed the committees to Corpus Christi. Mr. Gilliam congratulated the members and manufacturers for their cooperation and effectiveness in preparation of standards for meters and metering equipment and their continued efforts to obtain an accurate metering device at a nominal cost.

Mr. Gilliam briefly described the area served by CP&L. He said their franchised service area was about 44,000 square miles or about one-fifth the area of Texas and that their customer density averaged about five customers to the square mile. CP&L has varied manufacturing and industry as well as large cattle and agricultural interests in their area.

In the absence of G. A. Palmer, R. B. Swallow presented a progress report in behalf of the task force preparing a revision of the *Metermen's Handbook.*

### Sullivan Talks

F. W. Sullivan described various changes in municipal and state wiring legislation, primarily in connection with rules requiring 100-ampere minimum services for residential construction.

G. F. Austin announced that it had decided to pursue the study of planning meter tests using conventional time schedules in addition to the work being done on application of statistical sampling methods to the meter testing problem.

W. H. Farrington, chairman of Subcommittee on Codes and Rules; K. S. Field, chairman pro tem of the Subcommittee on Service Equipment; W. D. Lindsay, chairman of the Subcommittee on Meters and Metering Equipment; and G. W. Gerell, chairman of the Subcommittee on Meter Department and Management, presented reports.

### Wallace Presents Paper

A paper describing the economics of revenue collection was presented by J. M. Wallace, manager of the Meter Division of Westinghouse Electric Corp. After reviewing the history of electric revenue meters, Mr. Wallace stated that the three areas in which revenue collection costs might be reduced are in the rate form, the metering equipment and the billing and collection procedures. He advised that greater uniformity in rate forms and in metering practices should help to reduce the cost of metering devices.

V. W. Nass described the possible savings without introducing substantial errors, which might be effected as a result of using 2½ element meters in lieu of three element meters for revenue metering. Tests conducted by Commonwealth Edison Co. showed the statement made by two meter manufacturers that the two-stator meter was recommended where the voltage unbalance is less than one per cent and the power factor is reasonably high was correct. Discussion disclosed several companies now using three-stator meters were considering a change to use of two-stator meters.

A. D. Irion described the standardized service entrance switchboards used by all the serving agencies in Southern California. These sections are prefabricated by local manufacturers and approved by all the utilities operating in that area, designed for low-voltage, self-contained or instrument transformer meters, and are furnished in all cases by the customer. Mr. Irion stressed that considerable savings had been effected by both customers, contractors and the serving agencies as a result of using these standardized services sections.

The cost of meter testing was discussed by a task force consisting of W. J. Piper, F. G. Josberger and L. O. Steger. Discussion disclosed that some common methods of time accounting were necessary if worthwhile results were to be obtained.

The task force consisting of J. A. Morris, L. J. Beckwith, E. F. Blair, W. C. Harrison and C. V. Morey studying statistical sampling techniques as applied to sample meter testing reported that approval had been received in some states and was being reviewed by other state commissions.

New York now permits either conventional time scheduling of tests or use of a modified statistical sampling method. C. V. Morey stressed that a company could not change methods at frequent intervals without being penalized.

Results of corrosion tests conducted on various items of metering equipment were described by F. G. Josberger. Test stands were set up in exposed locations in Long Island and the equipment allowed to weather for 20 months; the devices were then com-

(*Continued on page* 395)

# Transmission and Distribution Committee Meeting

- *Automatic Fault Locator for Pipe Type Cable*
- *Mechanization of Underground Construction*
- *Decentralized Operations During Storm Emergencies*

**W. M. PENNEY**
*Chairman*

THE fall meeting of the Transmission and Distribution Committee was held Oct. 9-10 at the Hotel New Yorker in New York City with 220 members and guests in attendance.

### Underground

The opening session was sponsored by D. F. Tulloch, Chairman of the Underground Subcommittee.

H. E. Cody reported that results of the research project on soil thermal resistivity now are being digested. A summary paper is to be scheduled for presentation at the 1960 AIEE Winter Meeting.

H. L. Davis reported that performance data from the major users of paper and lead, duct-lay cable above 7.5 kv showed a troubled rate of 8.1 per 100 cable miles in 1956 as compared with 9.2 in 1955. Mechanical damage and corrosion accounted for 46 and 20 percent of troubles, respectively.

C. B. Bechtel described an automatic fault locator for pipe type cable circuits developed by the Baltimore Gas and Electric Co. The system is continuously monitoring and functions by comparing pressure wave transit times from the fault to each circuit terminal. Simulated tests indicate a maximum error of plus or minus six feet.

M. W. Ghen described a Duquesne Light Co. pipe-type cable pulling rig designed to occupy minimum street space and avoid the use of booms which would have to be assembled and dismounted.

D. F. Tulloch described a new type manhole extension ring developed by the Boston Edison Co. for use where street grades are raised by repaving. Five uniform and two tapered thicknesses take care of about 60 percent of these jobs. A crew can adjust 18 manholes per day with rings as compared with seven per day by conventional methods.

J. W. Bogdanowski reviewed mechanized devices used by the Consolidated Edison Co. of New York, Inc., to improve efficiency in underground construction and operation. These include a large transformer hauling truck with boom, precast manhole trailer, manhole flushing truck, duct rodding truck, horizontal earth boring machine, oil treating trailer, portable induction welding machine, gas leak detection truck, emergency field office truck and an array of trucks and trailers for pulling cable handling reels. This equipment was exhibited at a nearby parking lot.

### General Engineering

C. E. Bathe, Chairman of the General Engineering Subcommittee, sponsored a session covering a variety of subjects.

H. L. Davis, Jr., reviewed current Federal Communications Commission activities affecting power company use of radio. These include implementation of use of the newly allocated split channels for mobile radio and a forthcoming hearing concerning allocation of frequencies to the various nongovernment services in the entire spectrum from 25 to 890 mc.

H. W. Grate outlined remedies applied in recent cases of industrial plant trouble cause by momentary voltage dips and outages as reported to the Task Force on Voltage Dips and Short Service Interruptions.

L. Brieger discussed Consolidated Edison Co. experience with flicker voltage design limits. This has led to some liberalization of the limits where flicker occurs infrequently and few customers are involved. C. E. Bathe and W. M. Penney reported that Oklahoma Gas and Electric Co. and Union Electric Co. experience tends to support the changes described by Mr. Brieger.

W. J. McLain described tests of the effect of cyclic voltage fluctuation on television receivers. Although reactions of different receivers varied greatly it appears that the most objectionable rate of flicker is somewhat lower than that for incandescent lamps.

H. P. Seelye outlined Research Projects Committee plans to expand EEI research activities by working in collaboration with the individual engineering committees to provide for better coordination among individual company projects on related subjects and to determine areas where further research is needed.

W. R. Doar reported that tentative performance specifications covering electrical characteristics of aluminum connectors, based on research conducted by the Armour Research Foundation, are about ready to be issued for trial use.

W. J. Sanders described a test chamber and procedure developed by the Kaiser Aluminum & Chemical Corp. to perform accelerated tests on corrosion of aluminum connections. Experience has indicated that it provides an excellent means of comparing efficiencies of commercially available connectors under severe marine conditions by closely duplicating conditions of failure observed in actual operation.

### Standards and Specifications

F. C. Marschner, Chairman of the Standards and Specifications Subcommittee, called on task force chairmen for reports of their activities.

W. H. Johnson announced publication of TD-94, "Specifications for Locust Wood Insulator Pins with 1-inch Threads." The Timber Products Task Force is continuing work on a proposed specification for wood moulding, standardization of pole framing and standing pole inspection procedures.

C. E. Topping reported that an editorial revision of specifications for pole guards to bring them up to date soon will be issued and that the proposed revision of specifications for pole and tower steps has received a

generally favorable ballot. The new EEI-NEMA Joint Committee on Pole Line Hardware has assumed work on several other proposed new and revised specifications which had been initiated by the former Line Hardware Task Force.

A. T. Green reported that a proposed EEI-NEMA street lighting equipment standard for future design of a luminaire head which will receive a unit control device attached externally with a locking type connection is ready to be submitted to members for ballot. Good progress is being made on several other proposed standards.

E. T. Coupal reviewed activities of the EEI-NEMA Joint Committee on Distribution Cutouts and Power Fuse Standards. Principal effort presently is directed toward increasing cutout terminal sizes to accommodate larger conductors.

H. C. Bingham reported good progress in developing a proposed application guide for automatic circuit reclosers and sectionalizers.

### Safety

H. MacVaugh, Chairman of the Safety Subcommittee, sponsored the opening session on the second day.

E. W. Glancy, American Telephone & Telegraph Co., discussed safety considerations on joint use poles. He stressed the need for practices which will protect against accidentally energized street light brackets and bare vertical power grounding conductors. Suggested measures included grounding of street light brackets and running bare vertical grounding conductors directly to the neutral without any other connections.

H. J. Eliasen outlined the Consolidated Edison Co. training programs for splicers and linemen. Both programs consist of four major training periods of schooling and field assignment on increasingly complex types of work.

L. G. McLaughlin presented a film prepared by the Consolidated Edison Co. for use in conjunction with talks to policemen and firemen to explain the nature of the power system and the procedures to be followed when some part of the system is involved in an accident or fire.

C. E. Bathe described an accident which occurred when a pole being installed to relocate a 69-kv line contacted a live conductor.

### Overhead

The closing session was sponsored by R. Hicock, Chairman of the Overhead Subcommittee.

W. M. Penney reported that the proposed five-year research project on ways to control the growth of trees now has been inaugurated. Details of this project are described on page 284 of the September, 1958, issue of the EEI BULLETIN.

H. E. Cody conducted a review of street tree planting programs promoted by individual companies to provide long-range relief from tree trimming problems. A survey of members reveals that 26 companies have such programs in operation or authorized and that another 17 have programs under consideration. C. E. Baugh, Pacific Gas and Electric Co., and H. L. Williams, Cleveland Electric Illuminating Co., described features and results of individual programs which have been in operation for several years. These programs include general promotion through full-color brochures recommending suitable species and planting arrangements, specific promotion through the services of a consulting arborist offered to communities in the service area, talks to civic groups, display plantings of recommended species, and model ordinances for enactment by municipalities. G. R. Guthrie described a new program just initiated by the Indianapolis Power & Light Co. L. P. Works told how five Wisconsin companies are reducing costs of their programs by preparing a brochure suitable for their common use. V. O. Bernthal discussed possibilities of an industry-wide program at a national level.

A. Bjorklund described the United Illuminating Co. plan for decentralized operations during storm emergencies. The initial phase, conducted from central headquarters, consists of a survey of damage in 168 designated patrol areas conducted jointly with the telephone company and dispatch of two-man crews to cut down fallen wires. Following assessment of damage the service area then is divided into 11 zones for restoration operations.

D. F. Tulloch reported that the 1958 edition of the Mutual Assistance Roster has been issued and that the storm tracking procedure established among companies in the eastern area proved helpful in providing detailed information on the March 20-21, 1958, snow storm and Hurricane Helene. The Mutual Assistance Task Force is continuing studies to improve usefulness of both the Roster and the storm tracking procedure.

G. E. Olson reviewed Dow Chemical Co. service records and analyses of 120 pentachlorophenol-treated, southern-pine poles installed in various parts of the country. These indicate that the 5 percent pentachlorophenol treatment used still provides a preservative content sufficient to insure many more years of service life.

The remainder of the meeting was devoted to discussion of members problems.

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## Meter and Service Committee Meeting

(*Continued from page* 393)

pared with a control panel to detect the effects of severe over-normal exposure.

L. C. Ramon discussed Part III of the Standards for Watthour Meters, MSJ-10. There was unanimous agreement in the committee regarding the portions of Part III pertaining to socket type meters and Class 10 "A" base meters. However, there was divided opinion regarding Class 100 and 200 "A" base meters and the Type "B" meters.

The task force studying the revision of MSJ-10 Part II, consisting of G. J. Yanda, G. B. M. Robertson, J. S. Lineback, C. V. Morey, L. C. Ramon, W. D. Lindsay, R. B. Swallow, J. A. Morris, F. A. Salmon and A. T. Higgins reported that they had resolved the differences of opinion existing and felt an improved purchase specification suitable for both manufacturers and users would result.

Mr. Robertson, chairman of the AEIC-EEI-NEMA joint committees, advised the group on the present status of all joint standards; it appears they are practically all undergoing revision and in the final state of preparation.

# The Credit Picture

***Results of a Survey of the Credit and Collection Experiences of 76 Utilities Conducted under Supervision of the Customer Collection Committees, EEI Accounting Division and AGA Accounting Section***

*(This is the second Credit Picture report during the year 1958; however, the data covers 12-month periods ended June 30, 1958 and 1957, instead of six-months periods ended June 30. It portrays trends, therefore, that are not affected by seasonal conditions and monthly variations resulting from different practices by the 76 participating utilities.)*

COLLECTION results experienced by most business firms and utilities are influenced by business and economic conditions. These factors include unemployment, business failures, population shifts from one area to another, FRB Index of Industrial Production and others. For example, consumer credit outstanding and the extent to which customers are burdened with monthly installment payments affects the trend of past due accounts. During recent months the negative aspect of these factors has been more pronounced in some geographic areas of the nation than in others, resulting in a corresponding effect on collection results experienced by most companies in these areas.

A realistic appraisal of collection results by utilities should include a comparison with the experience of other business enterprises, as well as with the trends disclosed by the Credit Picture. When utilities adhere to sound credit and collection practices the trends of their active accounts past due and final write-off should generally parallel the trends reported by other leading business enterprises in the same area.

### Significant Trends

The Credit Picture trends that are of special significance to utilities concern past due accounts, disconnect notices, disconnects for nonpayment, security deposits, the number of accounts charged off, and the amount of charge-off. The following summarizes some of these trends as disclosed by the 76 utilities contributing to the Credit Picture report:

*Past due balances, disconnect notices and disconnects:* Past due balances outstanding as a percent of sales increased an average of 2.5 percent for residential accounts and 0.4 percent for all accounts during the 12 months ended June 30, 1958, compared with 1957. For the 12-month period ended Dec. 31, 1957, the amount of past due residential accounts increased 6.7 percent while the increase for all accounts was 3.1 percent over the previous year. This indicates a leveling off in the uptrend for past due accounts. According to most business firms, the uptrend in their past due active accounts has also leveled off and, in many cases, is currently declining. This is a reasonable expectancy inasmuch as any improvement in economic conditions should promptly be reflected in an improvement in past due accounts.

Because of the general uptrend in past due active accounts that prevailed during the 12 months ended June 30, 1958, disconnect notices issued by all utilities increased 11 per cent over the previous year; and the number of nonpayment disconnects increased by 13.6 per cent.

Several utilities have modified their practices with respect to requirements for security deposits as one means of lessening the exposure to further increases in write-off. The

TABLE I—CREDIT AND COLLECTION EXPERIENCE OF THE UNITED STATES GAS AND ELECTRIC UTILITIES FOR THE 12 MONTH PERIOD ENDED JUNE 30, 1958

Percent Increase or Decrease Over the Twelve Month Period Ended June 30, 1957

| | *East North Central* | *East South Central* | *Middle Atlantic* | *Mountain* | *New England* | *Pacific* | *South Atlantic* | *West North Central* | *West South Central* | *United States* |
|---|---|---|---|---|---|---|---|---|---|---|
| Sales (Dollars) | + 6.1 | +10.5 | + 5.7 | + 7.5 | + 5.3 | +10.9 | +12.0 | + 6.5 | + 8.5 | + 7.7 |
| Customers | + 1.8 | + 3.0 | + 0.9 | + 3.7 | + 1.1 | + 3.0 | + 2.2 | + 2.2 | + 2.1 | + 1.9 |
| Outstanding in Dollars | + 8.1 | +28.3 | +12.7 | + 9.8 | + 0.1 | + 2.7 | +14.2 | − 1.8 | + 4.6 | + 7.5 |
| Outstanding Percent of Sales | + 1.7 | +14.9 | + 6.5 | + 2.1 | − 5.0 | − 4.9 | + 1.2 | − 6.4 | − 3.6 | + 0.4 |
| Disconnect Notices | +17.1 | + 3.5 | − 1.0 | +20.8 | +11.4 | +20.1 | +17.8 | + 7.6 | + 7.9 | +11.0 |
| Non-Payment Disconnections | +17.8 | +13.6 | − 2.9 | +40.8 | +28.5 | +28.5 | +19.4 | + 4.6 | +12.5 | +13.6 |
| Deposits on Hand (Number) | + 8.3 | + 1.2 | +11.2 | + 5.9 | + 6.2 | + 7.3 | + 7.5 | +12.6 | − 3.9 | + 5.7 |
| Deposits on Hand (Dollars) | +13.6 | + 2.8 | +13.7 | + 8.6 | +10.3 | +34.4 | + 7.1 | + 7.9 | + 0.3 | +10.2 |
| Final Bills (Number) | + 6.4 | + 2.0 | − 3.3 | +24.0 | + 3.4 | + 2.4 | +11.9 | + 1.8 | + 6.3 | + 3.9 |
| Accounts Charged Off (Number) | + 6.7 | +23.1 | − 1.8 | +10.7 | − 0.1 | +14.3 | + 6.8 | + 2.9 | +15.2 | + 7.7 |
| Net Charge Off (Dollars) | +16.5 | +30.4 | − 0.8 | +42.4 | + 7.8 | +25.5 | +18.0 | +10.1 | +45.4 | +16.2 |
| Net Charge Off (Cents per Customer) | +14.4 | +26.6 | − 1.6 | +37.3 | + 6.7 | +21.9 | +15.6 | + 7.7 | +42.4 | +14.0 |
| Ratio-Net Charge Off to Sales | +10.5 | +16.7 | − 5.3 | +35.0 | + 3.6 | +15.4 | + 4.2 | 0.0 | +25.0 | + 4.8 |

number of security deposits outstanding, as of June 30, 1958, increased 5.7 percent, and the amount of these deposits increased 10.2 percent over the previous year. This increase in the number and amount of deposits is similar to the percentages reported for the 12 months ended Dec. 31, 1957, over the previous year.

### Off-Service Final Bills

Because of unemployment and/or customers moving from one area to another, there was a continued increase in the number of off-service final bills. During the 12 months ended June 30, 1958, the number of final bills increased by 3.9 percent, while the number charged off increased 20.1 percent. Moreover, the amount of final bills issued increased 7.7 percent, while the amount of net charge-off increased 16.2 percent. These ratios indicate that a higher proportion of the number of final bills issued proved to be uncollectible; also that there was an increase in the average amount per final bill written off. This was reflected in the increase of 14 percent in the charge-off as cents per customer served.

### Business Trend Affects Write-Offs

According to most business firms a decline in the uptrend of write-off, generally, cannot be expected until a few months following a sustained improvement in business and economic conditions. Whether or not this will be the experience of utilities may be reflected in future Credit Picture reports.

### Evaluating the Trend of Charge-Off

Net charge-off as a percent of sales is the index preferred by many utilities for evaluating the trend of charge-off. Because most of the charge-off generally is represented by residential accounts, it is especially significant to consider net charge-off as a percent of residential sales, as well as a percent of total sales. This is illustrated by Table II, shown at the top of columns three and four on this page.

TABLE II—RATIO OF NET CHARGE-OFF TO SALES AND PERCENT INCREASE

| | *Ratio of Net Charge-off to Sales, and Percent Increase* | | | | | |
|---|---|---|---|---|---|---|
| | *To Residential Sales* | | | *To Total Sales* | | |
| *Utilities* | *6-30-58* | *6-30-57* | *% Inc.* | *6-30-58* | *6-30-57* | *% Inc.* |
| 21 Gas | 0.45 | 0.45 | 0.0 | 0.32 | 0.32 | 0.0 |
| 31 Elec. | 0.56 | 0.51 | 9.8 | 0.21 | 0.19 | 15.7 |
| 24 Comb. | 0.42 | 0.40 | 5.0 | 0.19 | 0.18 | 5.6 |
| All Co's. | 0.47 | 0.45 | 4.4 | 0.22 | 0.21 | 4.8 |

## Our Common Problem

(*Continued from page* 380)

that the growth of government ownership could be a first step in history repeating itself.

Many times in recorded history other peoples have made bold attacks on tyranny, just as our forefathers did. They have made progress in obtaining rights and recognition for the individual. They made gains that exceeded anything that had gone before them. With the new freedom gained, they reached new heights of attainment. Always at some point, however, their vigilance began to lag and ultimately another dark age overcame them. It is a little difficult to understand why this has always come about.

Possibly it is because freedom for the individual brings with it a concomitant increase in responsibility. As possessions become old, they take on the shape of the commonplace and their true value is lost sight of. The costs of their preservation and upkeep seem irksome.

Our government, more than any other, belongs to the people. If it is to be preserved, they must preserve it. They must preserve it in wisdom and with the expenditure of sufficient industry to be well enough informed to know what is wise.

Our industries have been forced to the forefront of an issue which is the very epitome of the conflict between communism and private initiative.

It is a very great responsibility. We have much talent available to meet this challenge. The principal task is to organize it and to use it effectively.

How well we meet this task will be felt in this country long after our financial statements have been forgotten.

## *Increase Announced in EEI Bulletin Subscription Rates*

**Beginning with the January, 1959 issue, the subscription price of the Edison Electric Institute Bulletin will be increased from $2.00 a year to $3.00 a year for member companies and non-members in the United States and from $3.00 a year to $4.00 a year for non-members in foreign countries.**

**However, orders for subscriptions for the year 1959 received on or before January 31, 1959 will be accepted at the present rate.**

**This price adjustment is necessary because of continually rising production and paper costs.**

## Paul D. Brooks

PAUL D. BROOKS, Commercial Vice President in Charge of Sales, American Electric Power System, died Oct. 23 in the Englewood, N. J., hospital after a four-week illness. He was 53.

Mr. Brooks was a 30-year veteran in the electric utility industry. He was Commercial Vice President and a Director of the AEP Service Corp. and also a Vice President and Director of the AEP System's six operating companies.

### Well-Known Sales Executive

Well-known as a sales executive throughout the entire industry, he had served on numerous national committees and for several years had been a member of the EEI Commercial Division Executive Committee.

Before he joined AEP in 1954, Mr. Brooks had been associated with Ebasco Services, Inc., for 16 years and with the Tennessee Public Service Co., Knoxville, for nine years.

Born in Knoxville, he was a graduate of the University of Tennessee, where he received a degree in electrical engineering in 1929.

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## Nuclear Group Formed

(*Continued from page* 382)

clear power have aroused great interest and wide support from the utility industry. This is evidenced by the fact that a broad segment of the nation is represented by the companies which have joined together to give financial and other support to the proposal submitted to the AEC today."

The AEC's Sept. 22 invitation to industry resulted from legislation enacted by the 85th Congress calling for development and construction of a high temperature, gas-cooled, graphite-moderated power reactor. The legislation established a time scale for inviting proposals from industry. In lieu of an acceptable proposal from industry within 60 days after the AEC's invitation, the Commission was directed by Congress to build and operate such a plant at one of its installations.

Robert E. Ginna, Chairman of the Board of the Rochester (N. Y.) Gas and Electric Co., is president of HTRDA.

Member companies of the HTRDA, in addition to Philadelphia Electric, sponsor of the proposal to the AEC, are:

Alabama Power Co., Arizona Public Service Co., Atlantic City Electric Co., Baltimore Gas and Electric Co., California Electric Power Co., Central & South West Corp., Central Illinois Electric and Gas Co., Central Illinois Light Co., Central Illinois Public Service Co., Central Louisiana Electric Co., Central Power and Light Co., Cincinnati Gas & Electric Co.

Also, The Cleveland Electric Illuminating Co., Delaware Power & Light Co., The Detroit Edison Co., Gulf Power Co., Gulf States Utilities Co., Hawaiian Electric Co., Ltd., Idaho Power Co., Illinois Power Co., Iowa Public Service Co., Kansas City Power & Light Co., Kansas Power and Light Co., Kentucky Utilities Co.

Also, Middle South Utilities, Inc., which controls Arkansas Power & Light Co., Louisiana Power & Light Co., Mississippi Power & Light Co., New Orleans Public Service Inc.; Mississippi Power Co., Missouri Public Service Co., Montana Power Co., New York State Electric & Gas Corp., Niagara Mohawk Power Corp., Pacific Gas & Electric Co., Pacific Power & Light Co., Pennsylvania Power & Light Co.

Also, Portland General Electric Co., Public Service Co. of Colorado, Public Service Co. of New Mexico, Public Service Co. of Oklahoma, Public Service Electric and Gas Co., Puget Sound Power & Light Co., Rochester Gas and Electric Corp., St. Joseph Light & Power Co.

Also, San Diego Gas & Electric Co., Sierra Pacific Power Co., Southern California Edison Co., Southwestern Electric Power Co., Utah Power & Light Co., Washington Water Power Co., West Texas Utilities Co.

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## ASA Approves 'Residential Wiring Handbook'

The *Residential Wiring Handbook* published by the Industry Committee on Interior Wiring Design has been approved by the American Standards Association as *American Standard Requirements for Residential Wiring.*

Sponsoring organizations and endorsing organizations have been redesignated participating organizations of the Industry Committee on Interior Wiring Design, which becomes the sponsor under ASA procedures.

The 32-page handbook, a guide to electrical planning for new and modernized homes, is available from the Industry Committee on Interior Wiring Design, Room 1600, 750 Third Ave., New York 17, N. Y. Quantity prices given upon request.

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## Power in Russia: The Russian System and Ours

(*Continued from page* 376)

We can turn back the tide if we want to.

Our course is clear. We have before us the task of informing people of our system, and logically we should start with our own employees.

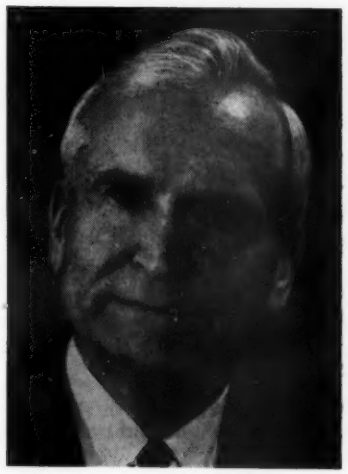
I left Russia with the feeling that a definite challenge had been laid down. Will we defend and preserve our system, or will we sit idly by while some other philosophy is taught us? We can stop this trend toward collectivism if we are willing to work at it. It seems to me that this challenge is particularly directed to all of us in the power business, who understand the true significance of our problem.

# People in Power

HAROLD QUINTON, President and Chief Executive Officer of Southern California Edison Co., was elected Chairman of the Board, and J. K. HORTON, a Vice President of the Pacific Gas and Electric Co., was elected President of SCE. W. C. MULLENDORE will retire as Chairman. All executive changes will be effective Feb. 1, 1959.

HAROLD QUINTON

J. K. HORTON



W. C. MULLENDORE

Mr. Quinton, 1954-1955 President of EEI, was the first West Coast electric company executive to hold the Institute presidency. He joined SCE in 1942 when he was elected vice president in charge of finance. Before that time he had been a partner for 16 years in the public accountant firm of Arthur Anderson & Co. He attended Northwestern University and served in the cavalry and field artillery in World War I.

Mr. Quinton was elected to SCE's board of directors in 1945 and became a member of its executive committee in 1949. In 1948 he was elected executive vice president and became president in 1954.

Mr. Horton is president of the Alberta and Southern Gas Co. Ltd., a Canadian company which is seeking to export gas from Alberta to Northern California. He was president of the five-member Pacific Public Service holding company at the age of 35. This group included Coast Counties Gas and Electric Co. which merged with Pacific G&E in 1954.

Mr. Horton holds a degree in economics from Stanford and a law degree from Oakland College of Law. He was admitted to the California Bar in 1941 and in 1943 joined Standard Oil of California as a legal specialist in oil and gas leases. He was elected secretary and legal counsel of the Pacific Public Service Co. in 1944. He was elected executive vice president and in 1952, president, of both the top company and the constituent operating companies.

Mr. Mullendore's retirement comes after more than 33 years of continuous service with SCE, the last 30 of which have been as a general officer. After serving three years as special counsel, he was elected successively to the offices of general attorney in 1929; vice president in 1930; executive vice president in 1931; president in 1945 and chairman in 1954. Mr. Mullendore will continue to serve as a member of the board.

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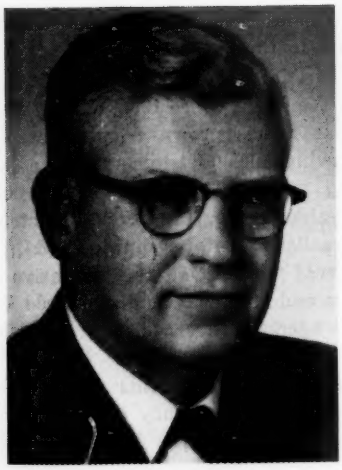
PAUL B. MCKEE, President, Pacific Power & Light Co., has been elected Chairman of the Board and D. R. MCCLUNG, Executive Vice President, was named President of the company. In other executive changes GEORGE F. MACKENZIE, Vice President and Treasurer, was elected Vice President and Controller; DON C. FRISBEE, Assistant Treasurer, was named Treasurer, and HAROLD H. HENNINGER, Forest Industry Sales Specialist, was named Assistant to the President.

Mr. McKee has served as president of the utility since 1933, during which time it has grown from a company serving 52,000 customers to one serving 303,000. He was for six years president of Emprezas Electricas Brasilerias before joining PP&L. He served as special representative on one and officer on another World War II agency concerned with Brazilian and Amazon problems. In 1953 he headed a survey team of American businessmen to study effectiveness of the Mutual Security Administration's Point Four program in Holland and Belgium.

Mr. McClung, with the company 41 years, joined PP&L in 1917 as a draftsman. He served as field engineer, assistant chief engineer, general superintendent and assistant to the president. During the Korean war, he spent six months in Washington as head of the materials and equipment division of the Defense Electric Power Administration. He was elected a vice president in 1948 and became executive vice president in 1952.

Mr. Mackenzie started with the company in 1913 and was elected a vice president in 1957. Mr. Frisbee joined the utility in 1953 as an administrative assistant to the president and was named assistant treasurer in 1956. Mr. Henninger has been with the company since 1936.



D. R. McCLUNG

PAUL B. McKEE

WILLIAM B. McGUIRE, Assistant to the President, Duke Power Co., has been elected president of the utility, succeeding NORMAN A. COCKE, who is retiring. Effective date of the executive changes is Jan. 1, 1959.

Mr. McGuire, a 48-year-old attorney, has been a Duke Power director since 1954. He was graduated from Davidson College and received a law degree from Duke University Law School. He joined Duke as assistant general counsel and was a member of the legal department until he was appointed assistant to the president.

Mr. Cocke is retiring after more than 50 years with Duke Power. He was named president in 1953. In addition to his role in the electric power field, he has been closely identified with the textile industry. He joined Duke interests in 1906 as an attorney.

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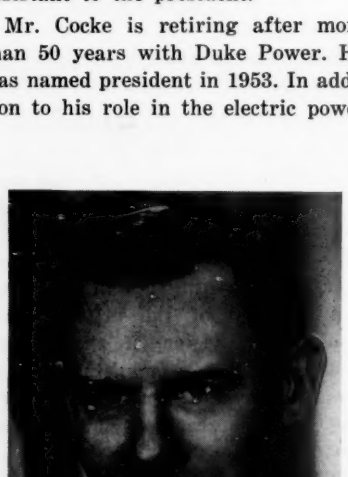
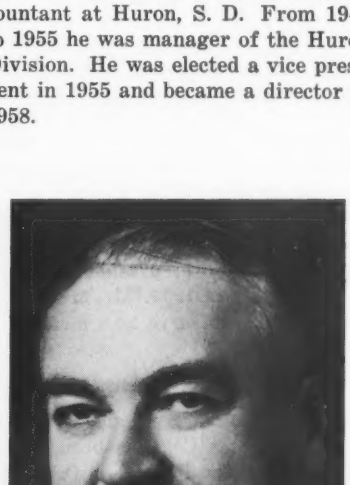
S. A. MOXNESS, Vice President and a Director of Northwestern Public Service Co., has been elected President of the company, succeeding G. R. McArthur who has retired as President and Chief Executive Officer. A. D. Schmidt, Superintendent of Gas Properties, was named Vice President-Operations.

Mr. Moxness joined the utility in 1933 and in 1934 was named chief accountant at Huron, S. D. From 1944 to 1955 he was manager of the Huron Division. He was elected a vice president in 1955 and became a director in 1958.



WILLIAM B. McGUIRE



S. A. MOXNESS

## Fatal Accidents Survey

(*Continued from page* 386)

10 years, a commendable improvement. Our favorable accident experience around stations narrows our accident prevention problem considerably and points out that our attack must be focused on those accidents involving line crews in the field.

One of the goals the electric light and power industry has been working toward for many years is reducing its accident frequency rate below the average for all industry. This is the day all utility men have been looking forward to and if all goes well it may arrive soon, as our frequency for 1957 or 6.39 is only 0.12 over the 1957 all-industry average of 6.27.

There is, however, a second goal even more important on which we need to concentrate our efforts in the prevention of accidents that will be more rewarding — the reduction of our industry severity rate below the average for all industry.

To do this we must prevent the accidents that result in fatalities and long periods of disability and which are the most costly to our companies. If we can get our severity curve to cross the severity curve for all industry, we will make one of the greatest possible advancements in safety.

The spread between these two curves for 1957 was the difference between 1382 (our severity rate) and 740 (the average severity rate for all industry).

The record shows that 68.7 per cent of our severity rate for 1957 was due to the assigned days for fatal accidents.

Our severity rate for 1957, exclusive of fatals, would have been 433 or 307 under the 1957 all industry average.

The safety performance of the electric utility industry as revealed by these statistics is a record of fatalities which can be reduced and prevented by concentrating our accident prevention efforts on the prevention of those accidents that affect our severity rate so much, namely, electric shock and burn accidents. Can our industry afford a severity rate almost twice as high as that for all industry?

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